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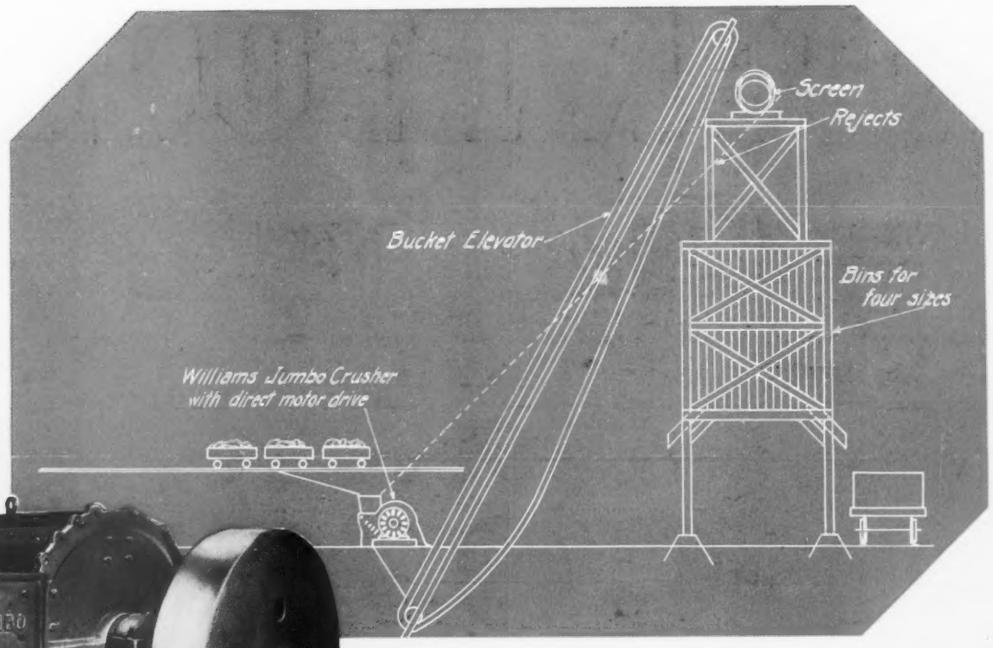

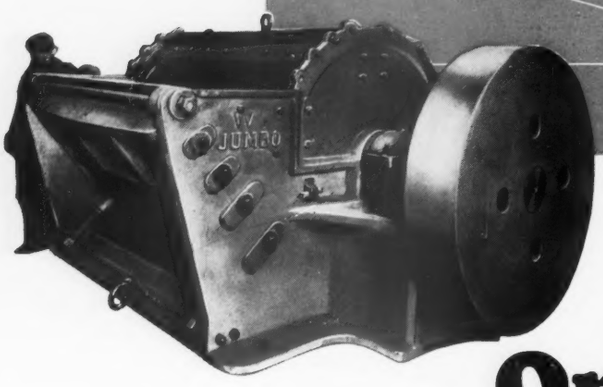

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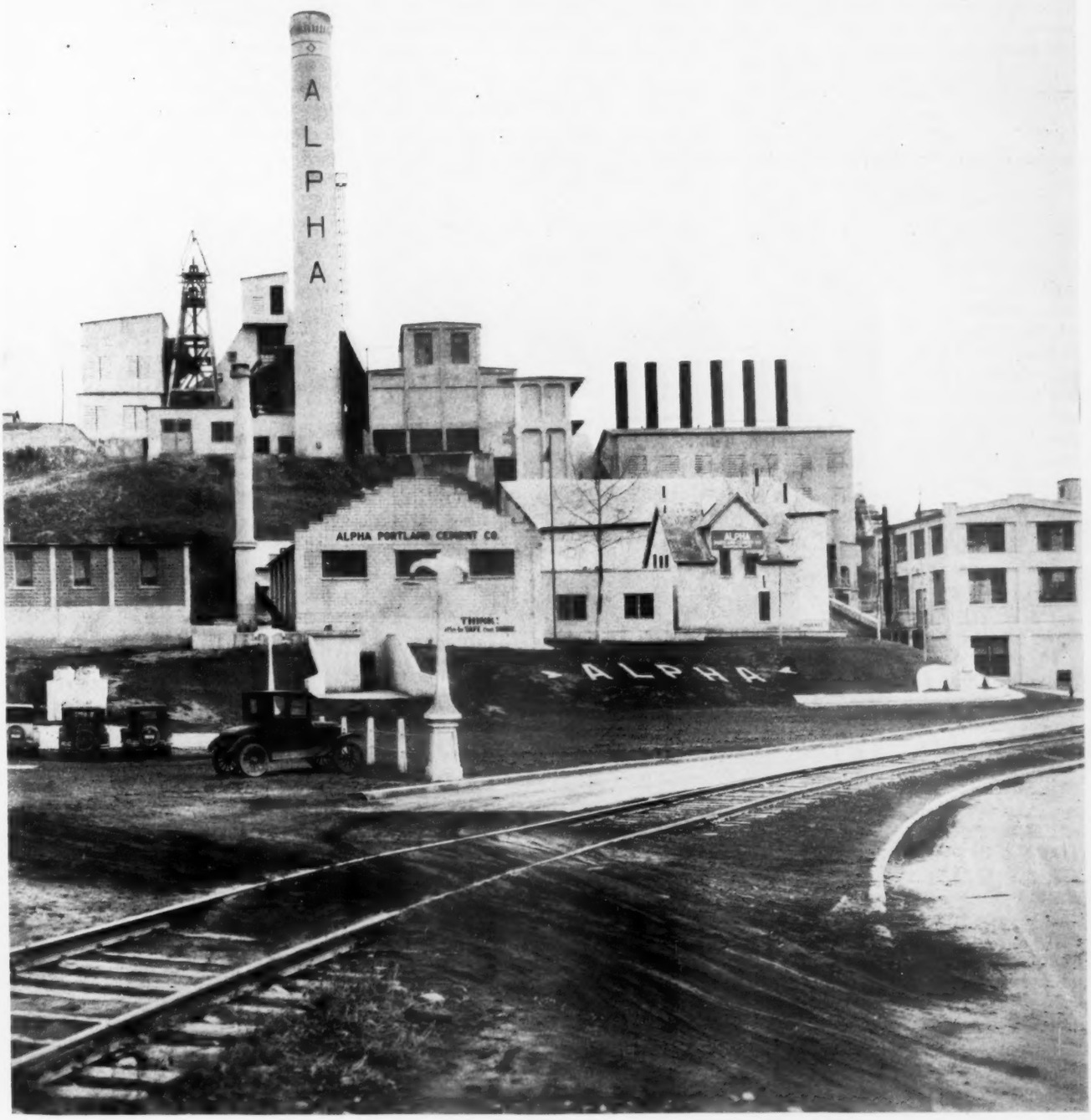


Ironton, Ohio, plant of the Alpha Portland Cement Co.; one of the 17 winners of the Portland Cement Association's 1928 Safety Trophy, also a previous winner (see trophy monument at extreme right at bend in roadway); incidentally showing that even an old cement mill may be made attractive

Miamiville Plant of American Aggregates Corporation

Large Sand and Gravel Plant Starts Operation in Cincinnati Territory

THE LARGEST and what, for the moment, at least, can well be called the most modern sand and gravel washing plant in the Cincinnati, Ohio, territory was placed in operation December 31, 1928, by the American Aggregates Corp. at Miamiville, Ohio, a station on the Pennsylvania railroad, 16 miles northeast of Cincinnati.

This plant was originally designed for the Ohio Gravel Ballast Co., which was consolidated with the American Aggregates Corp. in July, 1928. At the time this consolidation was effected the parent company also took over the Red Bank Gravel Co. and the Cincinnati Sand and Gravel Co., all the plants being in this territory. These consolidations and others brought the producing capacity of the American Aggregates Corp. up to 10,000,000 tons per year for a total of 27 plants, making it largest sand and gravel producer in the middle west and ranking alongside of the world's largest producers.

The new Miamiville plant, which has a capacity of 450 tons of washed material per hour, is built of reinforced concrete and steel throughout, and is covered with "Armco" corrugated iron painted on the outside with an asphaltic base protective paint. The general arrangement of the plant is such as to lend itself to economical operation, and at the same time it has a neat and orderly appearance. It can be said without stretching the point that the entire operation is one of the most modern high capacity plants built during the last few years in the United States.

The company has several hundred acres of gravel-bearing ground, most of which has been thoroughly prospected to determine the quality and quantity of the material, and at present only a small pit has been opened up. The pit is, roughly, 300 ft. long and 60 ft. wide with a vertical bank 35 ft. high.

The deposit here has a known depth of 56 ft. and exploration below that horizon was not conducted, as that depth is the mean water level of the Little Miami river which flows by the plant, and any gravel reclaimed below that depth would have to be dug by dredges or other sub-water means.

Method of Opening New Pit

At present this pit is being cut through so as to develop a longer face, after which a second shovel will be installed along with additional cars and locomotives to bring the operation up to its full capacity, but as the pit is small and developments just starting, quarry operations are not at present up to capacity.

The Miamiville plant, American Aggregates Corp., one of the most modern plants in the Cincinnati, Ohio, district

The deposit in the immediate vicinity of the plant is covered with 5 to 6 ft. of overburden, which is loaded into trucks by a Class B 1¼-yd. Erie steam shovel. The trucks haul the overburden to one of the abandoned pits from which the old plant of the Ohio Gravel Ballast Co. secured its material. The old plant is approximately one mile below on the river from the newer one.

The deposit itself is of unusual interest and remarkable for the high percentage of gravel that has to be crushed. The deposit will average 20% sand and 70% gravel and half of the gravel is of such size as to require crushing. The larger pieces of gravel are not big boulders but disk-shaped pieces running 4 to 8 in. in diameter and, roughly, 2 to 3 in. in thickness. Another unusual feature is that the smaller sizes of gravel are not flats but well rounded particles. In the crushing and screening operations on the large size gravel the crushed gravel is kept separate from the regular

Loading bins beneath the screening plant

gravel aggregates so that in substance the operation has two phases one a sand and gravel washing plant, and the other a crushed-stone operation.

Incidentally, the larger flat stones have been used to good advantage for construction of retaining walls around the skip loading pit and other places about the plant, as they easily lend themselves to such purpose by simply laying up without mortar, and this gives a neat and orderly appearance to what otherwise would be unsightly bank of sand and gravel.

Hydraulic Nozzle Helps Excavation

The gravel in the pit, partly owing to the presence of the large flat pieces, does not cave readily to the loading shovel, so it is customary, instead of poling the bank down as is ordinary practice, to direct a stream of water from a ½-in. nozzle at 50-lb. pressure against the bank, which effectively brings down the material where the shovel can safely get it.

At present, owing to the limited space in the pit, one No. 37 Marion steam shovel with a 1¼-yd. bucket loads to 6-yd. Koppel cars which are drawn in trains of two cars to the grizzly over the skip-loading pocket by a 20-ton Davenport steam locomotive. The company has on the ground a total of six cars and a 20-ton American steam locomotive for use when desirable, and later an additional shovel will be installed.

The cars, on arriving at the plant, are hand-dumped to a flat stationary grizzly made from old rails with bar steel for cross-members, making 11-in. square openings. The grizzly is on top of a reinforced-concrete, skip-loading pocket which holds 60 cu. yd., and from this pocket the two balanced 5-ton capacity skips, manually operated, are loaded by swinging cut-off gates actuated by individual Curtis air hoists. The loading is controlled by a man in the pit under the pockets and he also attends to the hoist and its operation. For capacity operation a total of 27 men are employed, which includes

Indicating the character and size of the gravel

stripping, pit and plant labor, as well as all repair labor and superintendence.

The skips are hoisted up the 45-deg. incline by a single-drum Lidgerwood hoist directly connected to a 175-hp. General Electric induction motor. The drum is wound with 16 turns of 1-in. Leschen wire rope. The hoist is designed for a 10,000-lb. maximum rope pull, and makes the round trip in 50 seconds. A Cutler-Hammer magnetic brake is one of the control features of this hoist, others being devices to protect the drum from over winding, stoppage of power, etc. A Cutler-Hammer motor operates the brakes.

Screening

The steel skips, on arriving at the top of the long incline, are self-dumped to a steel, hopper-bottomed bin serving the single 16-ft. by 60-in. rotary scalping screen, and the control of material passing to this scalper is by a gate which is opened and closed by a Curtis air hoist. The steel incline is 204 ft. long on a 25-deg. angle with a vertical lift of 146 ft. Water is supplied the primary

Shovel working in the pit

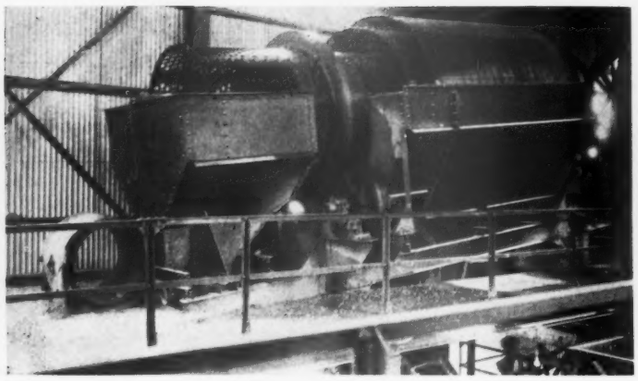
screen, the amount of water being 500 gal. per minute. The main gravel screen receives 1500 gal.; the crushed gravel screen 1500 and the re-sizing screen 500 gal. of water per minute.

The entire scalper is provided with 4-in. round perforations, and the oversize from this screen falls to a reinforced-concrete storage bin ahead of the 16-in. Allis-Chalmers "McCully" gyratory crusher. The flow of large gravel to this crusher is also controlled by a Curtis air-operated side wall gate.

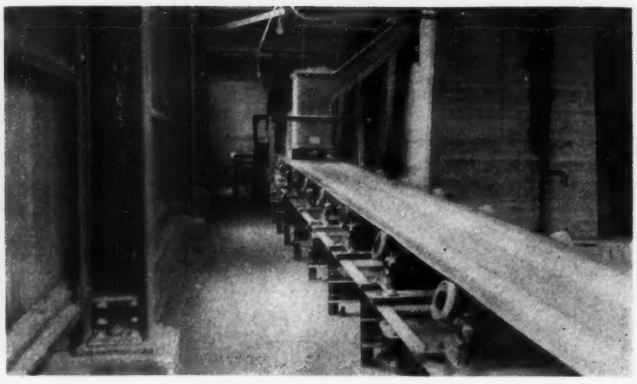
The fines from the scalper (minus 4-in.) are chuted direct to a Webster double-jacketed sizing screen. The main barrel of this screen is 12 ft. long with a 1¾-in. round

Stripping the 5- to 6-foot overburden

Grizzy over the skip-loading pockets. Oversize is sledged through the openings



Sizing screen for crushed gravel

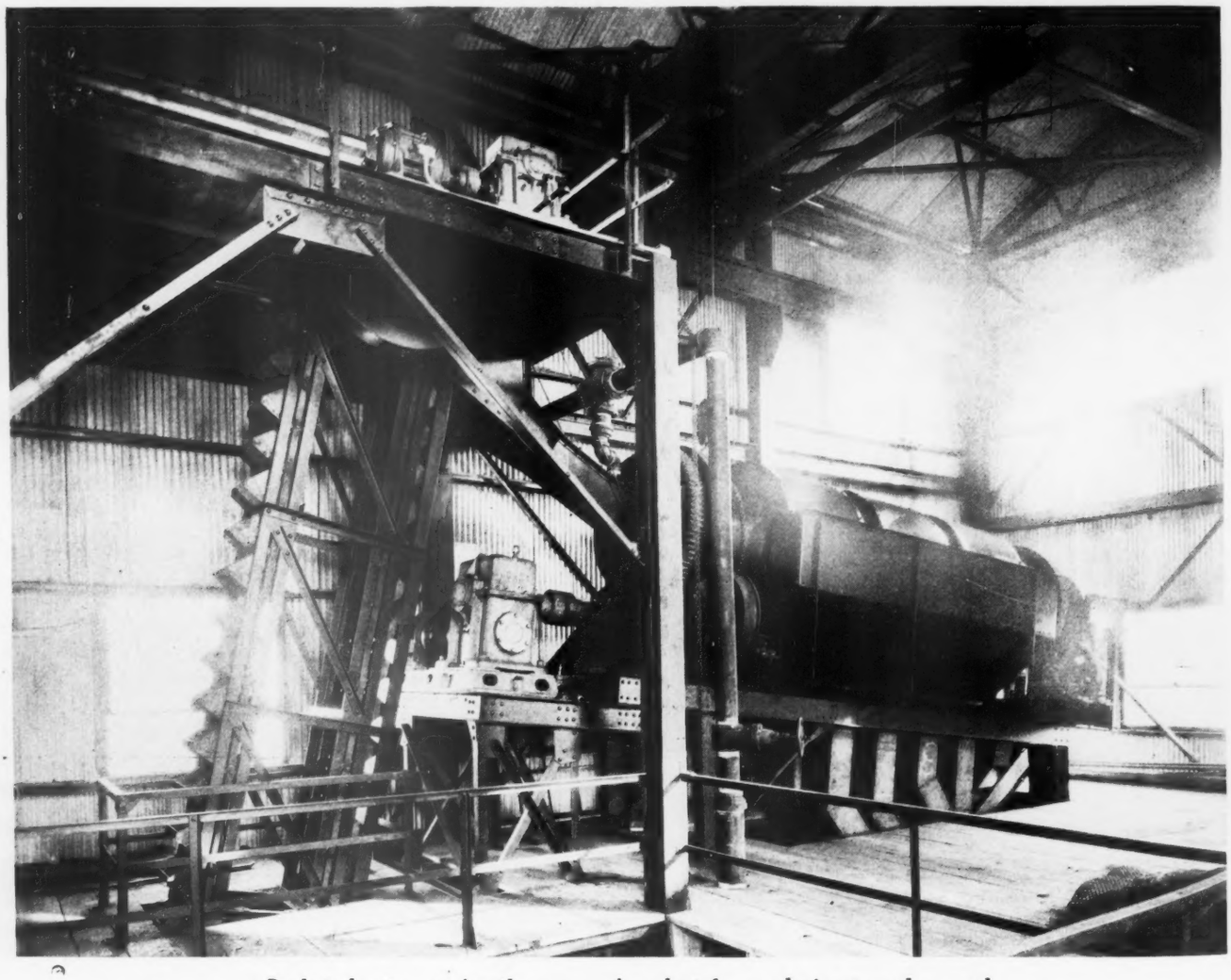


Belt conveyor carrying crushed gravel to gyratory

perforations and a 3½-ft. end section with 3-in. round openings. The first jacket has ⅝-in. round openings, and the second jacket has ¼-in. round perforations. This screen produces five sizes of material: minus ¼-in. (from which two grades of sand are later made); ¼-in. to ⅝-in.; ⅝-in. to 1¾-in.; 1¾-in. to 3-in., and 1¾-in. to 4-in. Any combination of these sizes can be made by a series of distributing chutes.

The sands from the outer jacket pass to a chute having a ⅛-in. perforated plate bottom, the oversize flowing to a Webster, sand-drag tank, where the concrete sands are dewatered. The material passing this perforated plate flows to a second drag tank which produces the masons' sand. These two tanks are identical as to size and drives, each being 39 ft. 8 in. long with 70 steel flights, each 3 ft. by ¼-in. by 30-in. long, and are driven through Jones spur gear reduction units by 5-hp. General Electric 865-r.p.m. induction motors. The sand drag tanks each have a capacity of 75 tons per hour, delivering 98% free water.

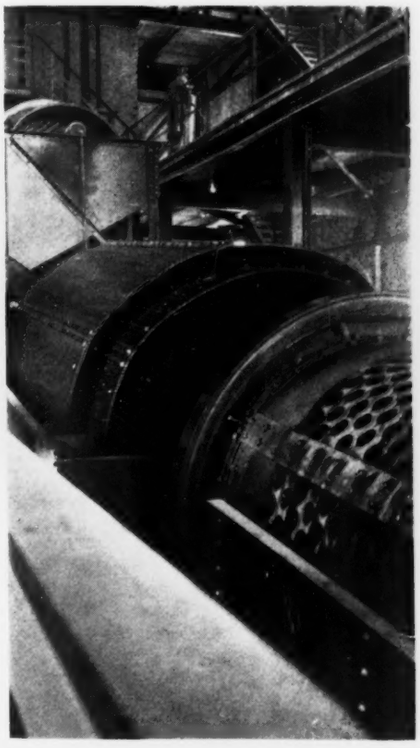
All the minus 1¾-in. material from the sizing screen can be chuted to the boot of a bucket elevator serving the re-washing screen, where six sizes of torpedo gravel can be secured. The re-washing screen is



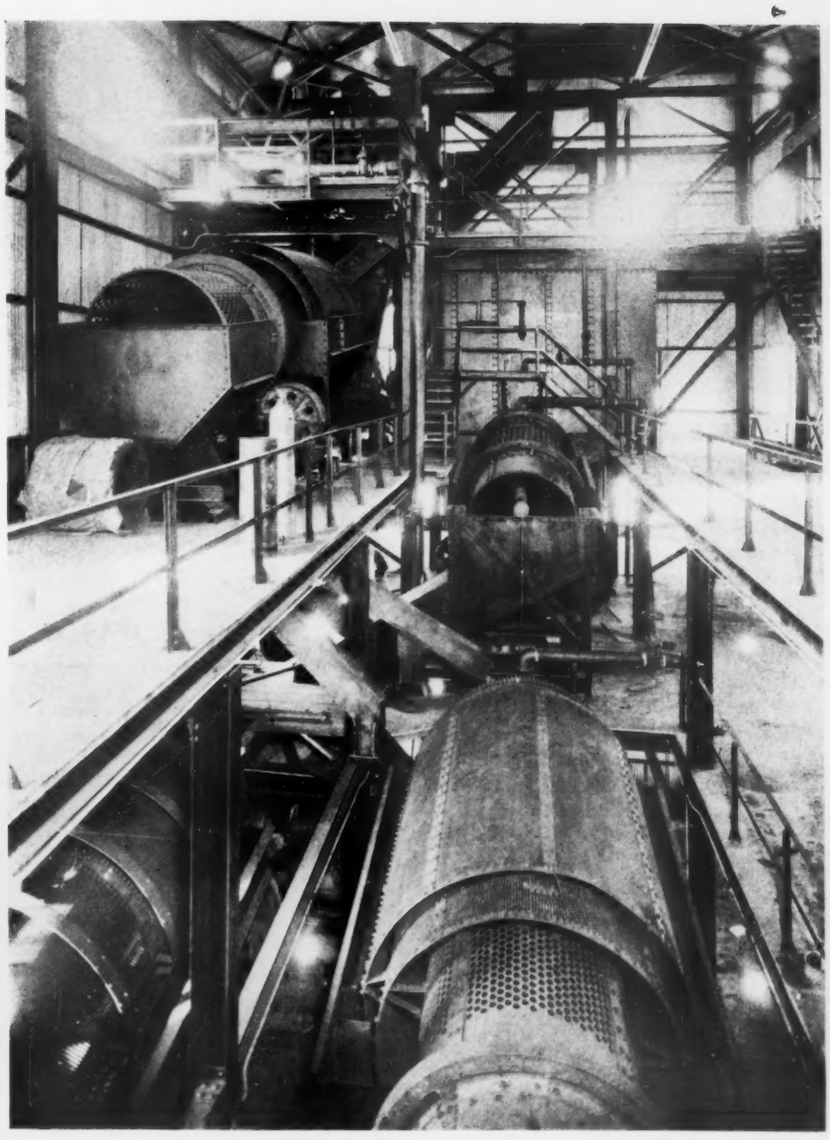
Bucket elevator serving the rescreening plant for producing torpedo gravel

48 in. in diameter by 22 ft. long, and has a single jacket of three separate screen sections. The different sizes of material can be re-combined in any proportion or may be mixed with some of the crushed gravel by means of a series of steel chutes. The sizes produced here are ¼-in. to ⅜-in.; ⅜-in. to ½-in.; ½-in. to ⅝-in.; ⅝-in. to ¾-in.; ¾-in. to 1-in., and 1-in. to 1½-in.

The bucket elevator serving the re-washer screen has 18x9x12-in. pitch buckets, 88 buckets in all, and operates on 46-ft. 6-in. centers. The elevator, which was supplied by the Webster Manufacturing Co., is driven through a Jones speed reduction unit (9½ to 1 ratio of reduction) and enclosed gears, by a 7½-hp. General Electric 865-r.p.m. induction motor. The re-washer screen, also furnished by the Webster Manufacturing Co., is driven through a Jones reduction unit (11⅔ to 1) by a direct-connected 20-hp. General Electric Co. induction type motor.



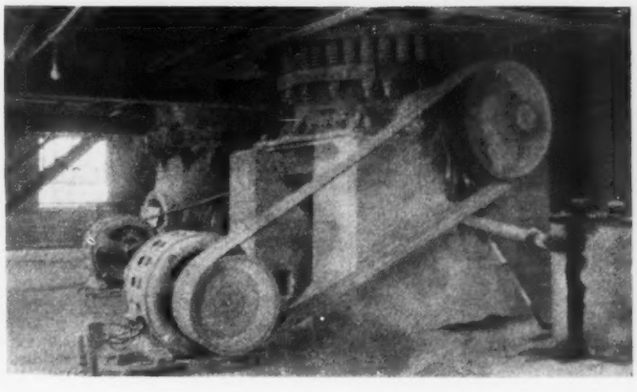
Closeup of the sizing screen



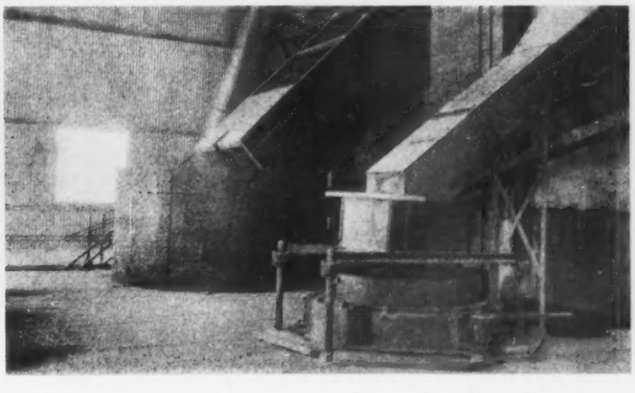
General view of the screening plant. At the upper left is the crushed-gravel screen

Crushers

The crushed gravel from the 16-in. gyratory crusher and that from the 48-in. Symons cone crusher falls to a 36-in. belt conveyor that serves the crushed-stone elevators. This conveyor is 65 ft. 6 in. center to center of head and tail pulley, and uses a Goodyear Style C rubber belt. This piece of equipment was supplied by the Webster Manufacturing Co. and is equipped with Alemite nip-

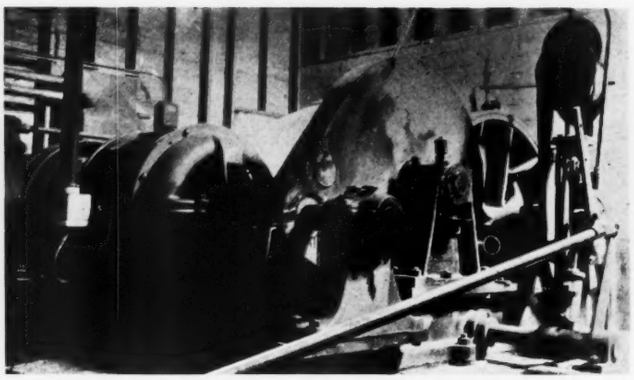


Gyratory and cone crusher handling oversize



Feed chutes to oversize crushers. Note the shields

One of the air-operated quadrant gates under the skip-loading pocket



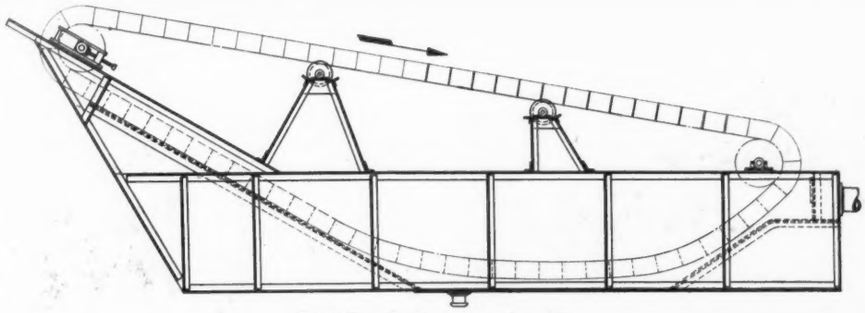
Skip hoist and motor at the skip-loading pocket

ples for lubrication. It is driven by a 5-hp. General Electric induction motor through a Jones spur gear reduction unit (34:1).

The 16-in. "McCully" gyratory crusher and the Symons cone crusher are placed in a large, well lighted room, the stone falling to both crushers is prevented from spilling by circular steel guards. Ample room is here provided for additional crushers should they become necessary later. An 8-ton, hand-operated Armington crane spans this room on overhead tracks for handling any machine parts incidental to repairs. A 5-ton crane of the same type also serves the screening plant.

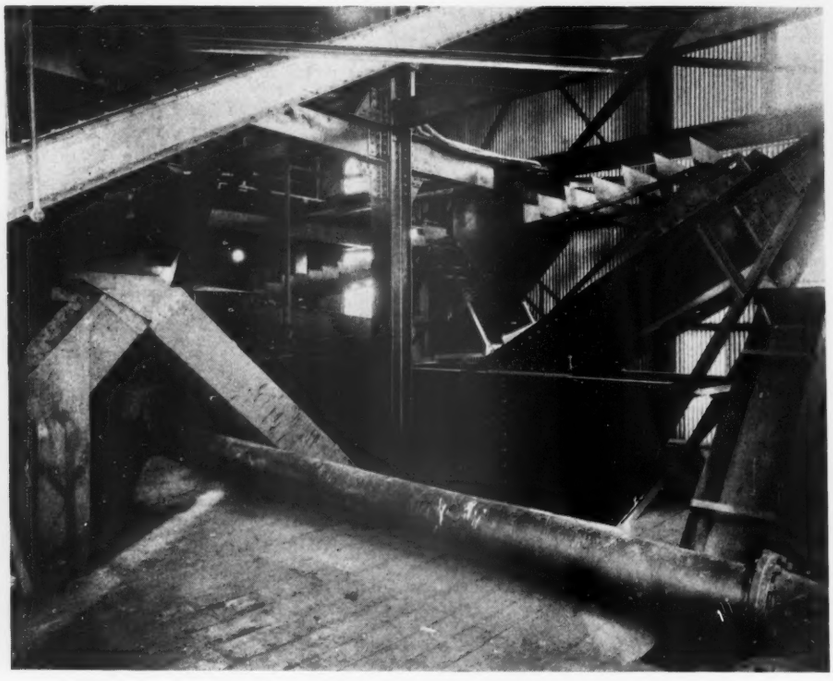
The 16-in. crusher is driven by a 75-hp. Allis-Chalmers induction motor, slip-ring type, through a 10-strand "Tex-rope" drive, and the Symons cone crusher has likewise a 75-hp. Allis-Chalmers induction motor, but uses an 8-strand "Tex-rope" drive.

The crushed gravel from the belt conveyor falls to a steel-bucket elevator, which has 100 buckets and operates on 69-ft. centers. This discharges to a second steel bucket elevator which has 66 buckets and operates on 43-ft. 6-in. centers. This is rather an unusual installation, and a double lift was deemed advisable on account of the high lift, as the weight of a single bucket



Details of the drag classifier

One of the steam locomotives handling cars at the pit



One of the sand drag classifiers

line of the length of these two would be excessive. The buckets are 27x14x18-in. pitch.

The first elevator is driven by a 25-hp. General Electric induction motor with "Tex-rope" drives, and the second lift elevator is driven by a 20-hp., 1160-r.p.m. induction motor using also a 4-strand "Tex-rope" drive. The elevator was supplied by the Greenville Manufacturing Works, a subsidiary of the American Aggregates Corp.

This elevator discharges to a 60-in. by 22-ft. Webster rotary screen which has a dou-

KEY TO DIAGRAM

P-1—2 air operated radial gates and bodies; 2 air hoists and mounting brackets.

P-2—2 skip buckets, 10,000 lb. capacity, 3000 lb. wt., 480 ft. per min.; bails, ball brg. sheaves—grease gun; truss spans — handrail — rails and sheave support.

P-3—Dump hopper of steel.

P-4—Air operated vertical slide gate; air hoist; chute to primary screen.

P-5—60-in. by 16-ft. primary screen; collecting hopper and discharge chutes.

P-6—60-in. by 22-ft. gravel screen; collecting hopper and discharge chutes.

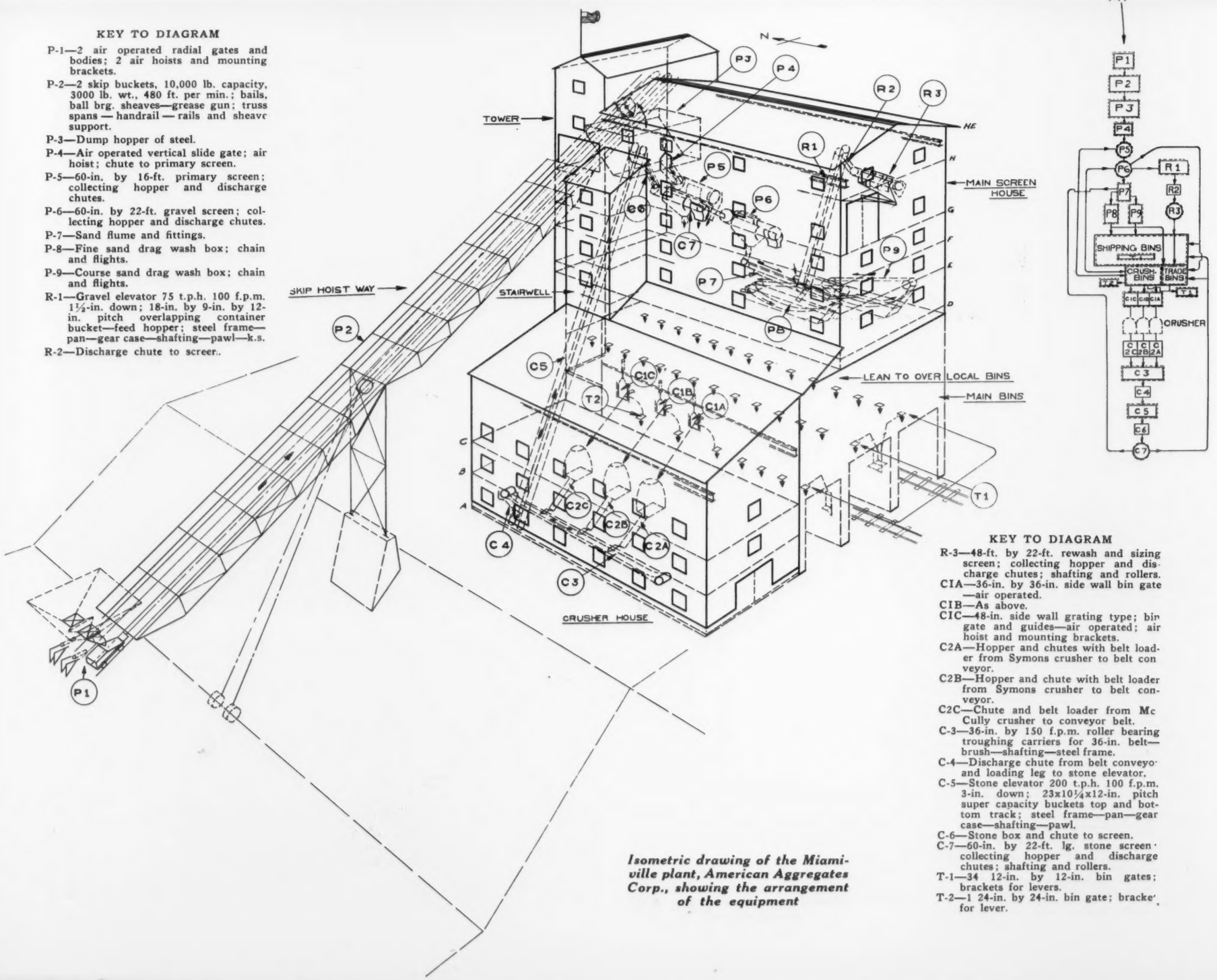
P-7—Sand flume and fittings.

P-8—Fine sand drag wash box; chain and flights.

P-9—Course sand drag wash box; chain and flights.

R-1—Gravel elevator 75 t.p.h. 100 f.p.m. 1½-in. down; 18-in. by 9-in. by 12-in. pitch overlapping container bucket—feed hopper; steel frame—pan—gear case—shafting—pawl—k.s.

R-2—Discharge chute to screer..



Isometric drawing of the Miamiville plant, American Aggregates Corp., showing the arrangement of the equipment

KEY TO DIAGRAM

R-3—48-ft. by 22-ft. rewash and sizing screen; collecting hopper and discharge chutes; shafting and rollers.

C1A—36-in. by 36-in. side wall bin gate —air operated.

C1B—As above.

C1C—48-in. side wall grating type; bin gate and guides—air operated; air hoist and mounting brackets.

C2A—Hopper and chutes with belt loader from Symons crusher to belt conveyor.

C2B—Hopper and chute with belt loader from Symons crusher to belt conveyor.

C2C—Chute and belt loader from Mc Cully crusher to conveyor belt.

C-3—36-in. by 150 f.p.m. roller bearing troughing carriers for 36-in. belt—brush—shafting—steel frame.

C-4—Discharge chute from belt conveyo and loading leg to stone elevator.

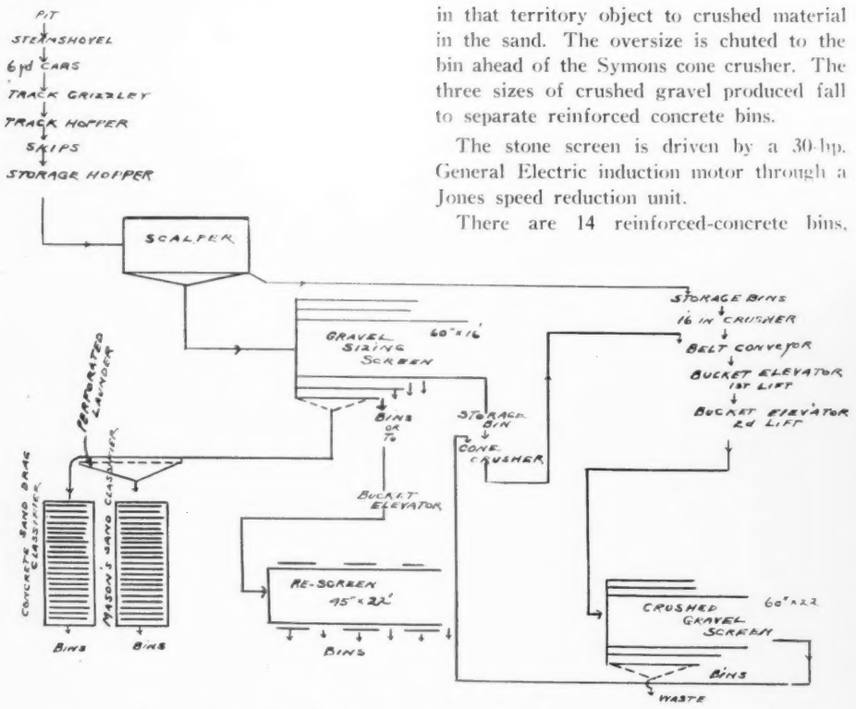
C-5—Stone elevator 200 t.p.h. 100 f.p.m. 3-in. down; 23x10¼x12-in. pitch super capacity buckets top and bottom track; steel frame—pan—gear case—shafting—pawl.

C-6—Stone box and chute to screen.

C-7—60-in. by 22-ft. lg. stone screen collecting hopper and discharge chutes; shafting and rollers.

T-1—34 12-in. by 12-in. bin gates; brackets for levers.

T-2—1 24-in. by 24-in. bin gate; bracke for lever.



Flow sheet, Miamiville plant, American Aggregates Corp.

ble jacket. The main barrel has 12 ft., of 1½-in. round perforations, and a 3½-ft. end overhung, with 2½-in. round perforations. The first jacket has 10 ft. of ⅞-in. round perforations and the outer jacket has

Skip under loading pocket ready to be filled

9 ft. of ⅜-in. holes. The crushed gravel washer is driven by a 30-hp. motor.

The fines from the outer jacket of the crushed gravel screen are carried to waste by the wash waters supplied by the screen. This is rather unusual practice, but the trade in that territory object to crushed material in the sand. The oversize is chuted to the bin ahead of the Symons cone crusher. The three sizes of crushed gravel produced fall to separate reinforced concrete bins.

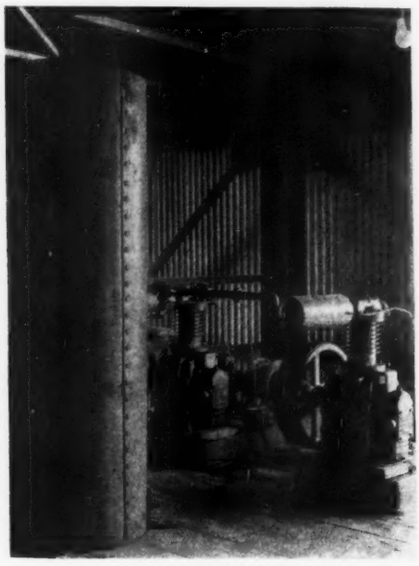
The stone screen is driven by a 30-hp. General Electric induction motor through a Jones speed reduction unit.

There are 14 reinforced-concrete bins, three for holding stone going to the crushers and two for handling batched materials to trucks. These last two bins are equipped with Blaw-Knox batchers. The railroad track bins are 13½x17¾ ft. in section and 20 ft. deep, each holding 250 tons of material. The crusher and truck bins are 13½x12½ ft. and 24 ft. deep, holding 200 tons.

The main building is 40x107 ft. in plan and is 125 ft. high. The crusher room adjoining the main building is 25x92 ft.

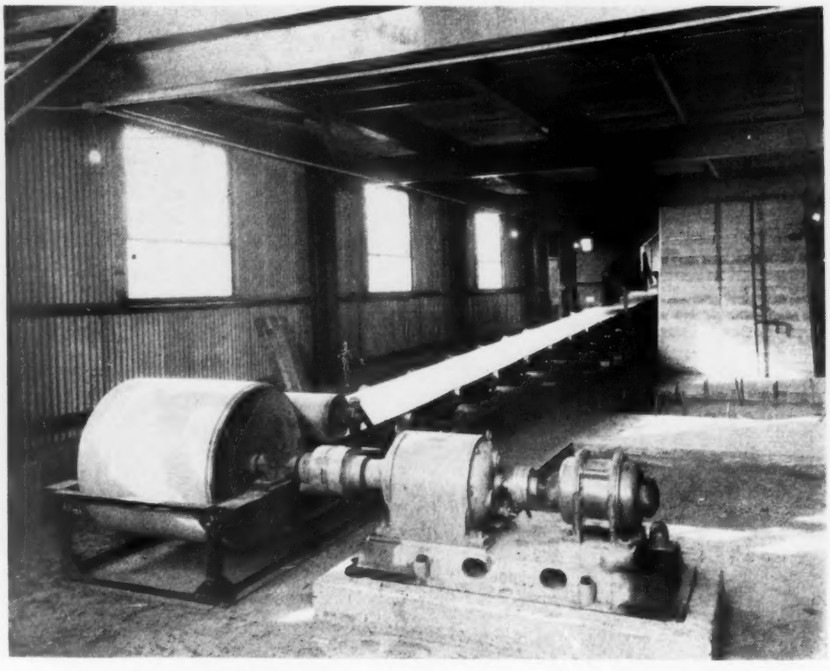
Air for operating the various bin gates is supplied by two 4½x5-in. Quincy compressors, each driven by a 5-hp. General Electric 1740-r.p.m. induction motor through a 4-in. leather belt. These compressors deliver air to a Morrison Bros. 24x72-in. vertical, welded air receiver.

Water for the washing plant is taken from the Little Miami river a short distance from



Air compressor and receiver for operating various gates

the plant, and is pumped to the washer by two Allis-Chalmers centrifugal pumps, each direct-connected to a 100-hp. General Electric, 1800-r.p.m., induction motor and each



Belt conveyor receiving stone from both crushers and delivering to the bucket elevator serving the crushed gravel screen

delivers 2000 gal. of water per minute against a 150-ft. head. The pumps deliver to a 16-in. pipe which divides to form a loop of 8-in. diameter pipe, and from this header water is delivered to the screens and other places of use. A small A. D. Cook well pump driven by a 2-hp. induction motor supplies water for miscellaneous uses.

Power is delivered to the plant at 33,000 volts by the Union Gas and Electric Co., and stepped down in their transformers to 440 volts for plant uses.

Personnel

The executive officers of the American Aggregates Corp. are: F. D. Coppock, president; C. E. Patty, vice-president and general manager; Guy C. Baker, vice-president and sales manager, with head offices at Greenville, Ohio. Fred W. Cornuelle is district manager in the Cincinnati territory, with offices at 611 American building, Cincinnati. W. R. Purcell, as chief engineer for the former Ohio Gravel Ballast Co., now chief engineer of the Cincinnati division of the American Aggregates Corporation, is largely responsible for the design.

The operating staff consists of: Earl C. White, plant manager; John Kelch, plant foreman, and E. J. O'Connell, plant office manager.

Cost of Dredging Sand and Gravel in England

A PAPER by C. H. Heathcote, delivered at the (British) Institute of Quarrying and published in the *Contract Journal* of London for October, 1928, is replete with figures of cost of dredging sand and gravel in England. The practice with both derrick boat dredges and pump dredges is considered.

By way of comparison with the figures to follow the paper first states that the cost of recovering sand and gravel by a slack-line cableway has been repeatedly stated to be 54c. per cu. yd. (The English money is converted to American in this and the other figures which follow at the rate of 2c. equals 1d.) This figure includes all costs so that it is the total cost of the material loaded on cars.

The cost for gravel and sand loaded on truck, recovered by a scow on which cranes and grab buckets are mounted, washed and screened, is given from the author's own knowledge at 48c. per cu. yd.

With electric power at 3c. per kw. h., the cost for power at a similar derrick boat plant is given at 6c. per cu. yd. For gravel on cars, washed and screened, the cost at this plant is 35c. per cu. yd.

Mr. Heathcote says that with the crude oil engines, which his company makes, power may be produced for 24c. for every 50 hp. hr. On the plant above mentioned the power cost would be cut from 6c. to 2½c. per cu. yd. by installing crude oil engines. The total cost on cars with crude oil engine power would therefore be reduced from 35c. to 31½c. per cu. yd.

Earl C. White, plant manager, Miamiville, Ohio, plant, American Aggregates Corp.

Regarding pumping, the paper says that the 8-in. pump is the size most used in England. Mr. Heathcote gives as his opinion that this size is too small to be economical and advocates the use of 10-in., 12-in., and even 16-in. pumps so that economies may be obtained comparable with those obtained "abroad" by means of larger pumps.

With a 150-hp. motor, a steel hull and pump, piping, suction and fittings of the best, the cost of an 8-in. electrically-driven, pump dredge is stated in the paper to be $5760. With a crude oil engine set of equivalent power and the larger hull necessary with this engine the cost will be $9600. The cost of screens on shore capable of dealing with 2000 cu. yd. per week mounted on concrete bins capable of holding 200 cu. yd. is given as $9700. With pipe line and some incidentals the full cost of an electrically driven 8-in. pump dredge and plant works out to $16,800 for electric power and $21,600 for crude oil engine power.

To show something of what is required in a pump dredge, a case is assumed of an 8-in. pump delivering through a pipe line 900 ft. long, the discharge containing 15% of solids. With a pipe-line velocity of 12 ft. to 13 ft. the frictional head is stated to be 70 ft. The pump speed should be about 730 r.p.m. and the output should be 75 yd. per hour and 100 hp. would be required. These figures are in line with American practice except that it is found difficult in most parts of this country to maintain 15% of solids in the pipe line discharge without the use of a cutter. Actual tests more often show from 7% to 10% of solids in the discharge except in a few favored localities where the sand in a river bed runs readily to the suction.

Consistency Measuring Instruments for Calcined Gypsum

AT the request of Committee C-11 on gypsum of the American Society for Testing Materials, a study of the instruments for determining the standard testing consistency of calcined gypsum was undertaken at the Bureau of Standards. The instrument used at the present time is the Southard viscosimeter. It consists, essentially, of a circular plate 12 in. in diameter with a well 2 in. in diameter in the center, fitted with a false bottom. The well is filled with the mix to a depth of 2.5 in. and the mix forced out at the top by means of a screw under the false bottom. The mix is said to be of standard testing consistency when the spread of the pat is 9.7 cm. as read on the circular plate. The other instruments which were compared with the Southard viscosimeter were the Hammond and the modified Vicat apparatus. The Hammond apparatus consists, essentially, of a 2x4-in. cylinder, which is filled with the mix and then raised vertically by means of a weight, through lever action, allowing the mix to spread out on a glass plate. The diameter of the pat is read on a scale beneath the glass plate. The modified Vicat instrument consists of a plunger of a fixed weight made of aluminum tubing. The end that penetrates the mix is 0.75 in. in diameter and 1.75 in. in length. The plunger is allowed to drop vertically into the mix contained in a rubber ring mold 7 cm. in diameter at the base, 6 cm. in diameter at the top and 4 cm. in depth. The penetration is determined by the drop of the plunger as read on a millimeter scale. The weight of the plunger may be varied by loading with shot.

A mix of gaging plaster was made up to standard testing consistency as determined by the Southard viscosimeter, and after many tests it was found that the most suitable penetration of the plunger of the Vicat was 30 mm., and this penetration was obtained when the plunger weighed 51 g. A mix of gaging plaster of standard testing consistency when tested on the Hammond machine gave a spread of 4.1 in. It was found necessary to add retarder before making any test, or reproducible results could not be obtained.

The three instruments were then used to determine the standard testing consistency of six types of plaster and to determine which instrument was the most satisfactory. It was found that the three instruments did not check for all types of materials, and that reproducible results could not be obtained for some types on any one instrument. The modified Vicat apparatus was found to be more sensitive to changes in consistency, easier to operate, and the penetration as shown by the drop of the plunger was more nearly proportional to the consistency than was the spread as shown by the Southard viscosimeter and Hammond machine.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Black Hills Marble Quarries Corp.—Quarry and kilns show at the right and the new rotary kiln at the left

Quarrying Limestone in the Black Hills of South Dakota

By Francis Church Lincoln
Professor of Mining, South Dakota State School of Mines, Rapid City, S. D.

LIMESTONE is at present the principal commercial stone of the Black Hills of South Dakota, although quarried but to a slight extent in other parts of the state. Geologically, the Black Hills region is a great domical uplift which has been eroded to expose a core of Algonkian rocks about which a succession of sedimentary formations ranging from Cambrian to Cretaceous outcrop as a series of elliptical rings with outward dips and increasing diameters. Numerous limestone strata are involved in this uplift, varying in age and character from Algonkian marble in the crystalline center to Niobrara chalk of Upper Cretaceous age on the outskirts.

The most important commercial limestones of the Black Hills are the Pahasapa limestone of Mississipian age, which has a thickness of from 300 to 630 ft.; and the Minnekahta limestone of probable Permian age with a thickness of from 30 to 50 ft. The Whitewood limestone of Upper Ordovician age, which has been used as a smelter flux, occurs in the northern Black Hills, where it reaches a maximum thickness of 80 ft., but thins out rapidly toward the south and is not found in other sections. A little Algonkian marble has been produced; and the Niobrara chalk, while not utilized in the Black Hills region, has been mined in the eastern part of South Dakota for use as a building stone and in the manufacture of portland cement.

The chemical characteristics of these limestones are shown in Table 1. The Pahasapa is commonly a high magnesium limestone as in Analysis 1; but in the neighborhood of Pringle in the southern Black Hills it is a high calcium limestone as indicated by Analysis 2. The Minnekahta is always a high calcium limestone and is fairly uniform in composition, as shown by Analyses 3 to 8 inclusive; while the Niobrara is also a high calcium limestone though less pure than the Minnekahta, as shown by Analysis 8. The Whitewood is a dolomitic limestone higher in magnesium carbonate than the average Pahasapa limestone.

Limestone quarry and crushing plant of the Black Hills Marble Quarries Corp.

Quarrying limestone for decorative stone near Rapid City

History of Limestone Quarrying and Use

Limestone production in South Dakota began as early as 1887 and reached a value of $3663 in 1894, according to "Mineral Resources of the United States." The early production was about equally divided between limestone for use as a building stone

and limestone for burning to lime; but the employment of limestone as a building stone rapidly declined, while its use in the manufacture of lime steadily increased.

portance, and remaining one of the chief present uses. In 1910, large amounts of limestone were quarried for road metal—another use which has persisted. In 1911

same limestone were used in the Black Hills sugar plant's 1928 campaign.

Two uses for Black Hills limestone which have been tested during the past two years

TABLE 1.—COMMERCIAL LIMESTONES OF SOUTH DAKOTA

No.	Formation	Producer and Locality	Calcium carbonate	Magnesium carbonate	Iron and aluminum oxides	Silica and silicates	Sulphur trioxide	Total
1	Pahasapa	Dark Canyon Stone Co., near Rapid City	67.86%	29.56%	0.36%	2.10%	.....	99.88%
2	Pahasapa	F. V. Redenbaugh, near Pringle	97.87	0.67	0.36	1.14	.....	100.04
3	Minnekahta	State Cement Plant, Rapid City	95.32	0.96	1.00	2.92	0.06%	100.26
4	Minnekahta	Black Hills Marble Quarries Corp., Rapid City	98.19	0.96	0.46	0.76	None	100.37
5	Minnekahta	Northwestern Cement Co., Rapid City	98.32	0.98	0.24	1.24	.....	100.78
6	Minnekahta	Homestack Mining Co., Calcite, near Piedmont	95.5	1.0	0.9	2.5	0.1	100.00
7	Whitewood	Golden Reward Mining Co., Deadwood	62.82	35.89	0.40	0.42	.....	99.53
8	Niobrara	Western Portland Cement Co., Yankton	90.78	Trace	4.53	4.14	(Sulphur, 0.50)	99.95

REFERENCES

1, 3 and 8—Lincoln, F. C., "Rock Products Industry of South Dakota," ROCK PRODUCTS, Volume XXX, 1926.
2, 4 and 7—Analyses by C. J. Bentley, Mines Experiment Station, South Dakota State School of Mines.
5—Average of analyses of sugar rock for 1927 by Black Hills Sugar Plant, Belle Fourche.
6—Analysis furnished by A. J. Clark, Metallurgist, Homestake Mining Co., Lead.

Table 2, compiled from the annual volumes of "Mineral Resources of the United States," shows a sudden rise in the annual production of limestone in South Dakota to $26,858 for the year 1898. This is due to the inclusion of limestone quarried for smelter flux for the first time in the annual production total; but the Deadwood and Delaware smelter, later known as the Golden Reward smelter, had been operating and employing limestone flux for some years prior to 1898, so the earlier production figures in Table 2 are too low. Flux for this smelter was obtained from a neighboring quarry in the Whitewood limestone; from a second neighboring quarry opened in the Pahasapa limestone on the hill above the Whitewood limestone quarry; and from a large quarry in the Pahasapa limestone at Dumont, 15 miles to the southward on the line of the Chicago, Burlington and Quincy railroad. During the period when this smelter was in operation mining smelter flux was the most important limestone quarrying operation in the Black Hills, but with the shutting down of the Deadwood smelter in 1903 and of the Rapid City smelter a little later, the production of limestone for flux ceased.

Meanwhile, the use of Black Hills limestone as concrete aggregate developed, first noted in 1902, but increasing rapidly in im-

and succeeding years, large quantities of limestone were produced for use as railroad ballast and riprap. The Chicago, Burlington and Quincy railroad opened a large limestone quarry in the Pahasapa formation near Argyle in the southern Black Hills, where considerable stone was quarried and crushed for use as ballast; and the Chicago and North Western railway quarried Minnekahta limestone for ballast from pits along its right-of-way between Whitewood and Deadwood in the northern hills; but little ballast or riprap has been produced in recent years.

In 1912, high calcium Pahasapa limestone in the vicinity of Pringle was quarried and shipped out of the state for use in the manufacture of beet sugar. Shipments of sugar limestone from this locality to refineries in other states have continued to be important, although irregular, down to the present time. With the completion of the Black Hills sugar plant of the Utah-Idaho Sugar Co., at Belle Fourche, S. D., in 1927, Black Hills limestone began to be employed in local sugar manufacture. Selected Minnekahta limestone from the Northwestern Quarry Co. at Rapid City proved most satisfactory for this purpose. The average analysis of some 5000 tons of this rock used in the 1927 Belle Fourche sugar campaign is given as Analysis 5 in Table 1. About 6000 tons of the

with favorable results are as a decorative stone and as a binder for siliceous gravels on roads. A carload of blocks of Minnekahta limestone was shipped from Belle Fourche Canyon near Rapid City to St. Paul in the fall of 1926. This stone was quarried at the locality shown in the illustration, and when cut and polished made a very handsome decorative stone.

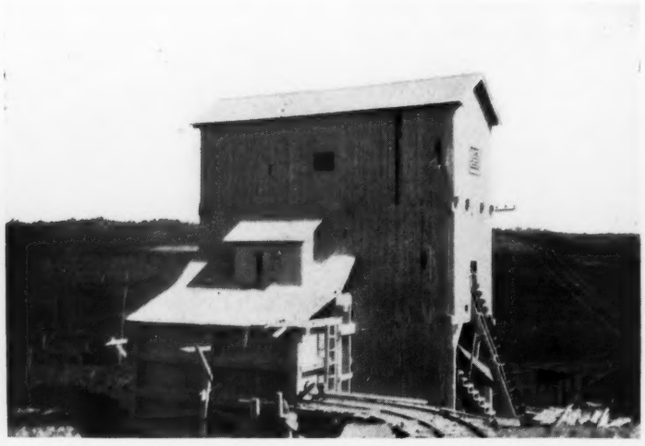
In the summer of 1927, limestone fines from the crushing plant of the Northwestern Quarry Co. were spread upon the loose siliceous gravel on a section of road near Rapid City; while a second section of this same road received a layer of limestone fines with which a small amount of pyrite had been mixed. In both cases, the limestone fines produced a natural binder under the action of weathering, a cement which held the siliceous pebbles firmly in place in the roadbed. Pyrite was added in one section with the idea that on weathering it would produce sulphuric acid which would react with some of the calcite in the limestone to produce gypsum which might add to the cementing value of the binder; but the pyrite weathered too slowly for this effect to be noticeable; and the limestone fines without the pyrite appeared to meet all requirements.

During 1928, limestone quarried in the Black Hills was used as road metal; as con-

Part of the limestone quarry, South Dakota's state cement plant

Opening the new quarry of the Black Hills Marble Quarries Corp.

Hand loading stone to a modern quarry car



South crushing plant, Northwestern Quarry Co.

crete aggregate in structures, paving and concrete products; in the manufacture of building, hydrated and chemical lime; in the manufacture of sugar, and in the manufacture of portland cement. In connection with this latter use, it should be noted that Table 2 omits limestone quarried for the manufacture of portland cement. It therefore fails to include the Niobrara chalk quarried by the Western Portland Cement Co. at Yankton between 1890 and 1910; and the Minnekahta limestone quarried by the state cement plant at Rapid City in 1925 and 1926. The state cement plant quarries more limestone annually than is quarried in South Dakota for all other commercial purposes combined.

TABLE 2.—LIMESTONE AND LIME PRODUCTION OF SOUTH DAKOTA

(According to "Mineral Resources of the United States")

Date	Limestone Tons	Limestone Dollars	Lime Tons	Lime Dollars	Limestone and lime Dollars
1887	.....	(*)	.....	.....	.....
1888	.....	.....	.....	.....	.....
1889	.....	(*)	.....	.....	.....
1890	.....	(*)	.....	.....	.....
1891	.....	.....	.....	.....	.....
1892	.....	.....	.....	.....	.....
1893	.....	100	.....	.....	100
1894	.....	1,650	.....	2,013	3,663
1895	.....	4,000	.....	.....	4,000
1896	.....	2,000	.....	1,126	3,126
1897	.....	2,000	.....	1,895	3,895
1898	.....	26,245	.....	613	26,858
1899	.....	35,807	.....	10,001	45,808
1900	.....	33,382	.....	14,380	47,762
1901	.....	39,950	.....	13,830	53,780
1902	.....	65,305	.....	21,300	86,605
1903	.....	26,215	.....	13,051	39,266
1904	.....	3,954	3,700	23,960	27,914
1905	.....	6,653	4,165	26,308	32,961
1906	.....	10,400	3,666	23,930	34,330
1907	.....	11,600	3,673	24,895	36,495
1908	.....	(†)	5,254	34,068	(‡)
1909	.....	(†)	5,309	35,982	(‡)
1910	.....	17,150	4,151	25,399	42,549
1911	.....	6,250	5,293	37,573	43,823
1912	.....	10,628	3,914	28,585	39,213
1913	.....	4,098	4,217	28,610	32,708
1914	.....	12,488	5,603	36,976	46,464
1915	.....	17,485	5,625	34,728	52,213
1916	.....	19,435	5,772	44,033	63,468
1917	.....	46,130	4,463	37,589	83,719
1918	.....	18,825	4,772	40,490	59,315
1919	17,750	23,989	4,205	56,540	80,529
1920	43,350	75,274	(†)	(†)	(§)
1921	24,880	42,000	(†)	(†)	(§)
1922	19,340	32,795	3,852	43,990	76,785
1923	43,280	70,190	(†)	(†)	(§)
1924	39,360	60,713	(†)	(†)	(§)
1925	73,080	97,880	(†)	(†)	(§)
1926	72,570	94,617	(†)	(†)	(§)

*Production noted but amount not stated.
†Production included with that of other states.
‡Figures available for lime production only.
§Figures available for limestone production only.

State Cement Plant Quarry

The state cement plant quarried about 85,000 tons of limestone in its first year; and its annual production increased to about 125,000 tons in 1928. The cement plant is located on the Chicago and North Western railway 2½ miles northwest of Rapid City, and the limestone quarry adjoins it. William A. Fowden is manager of the plant and A. G. Palmer is foreman of the limestone quarry.

The quarry is opened in the Minnekahta limestone which has a thickness of about 40 ft. in this locality and the composition shown in Analysis 3, Table 1. The limestone rests upon shale and is overlain by about 2 ft. of overburden. Holes from 40 to 42 ft. in depth are drilled through the limestone and 2 ft. into the shale. A No. 14, Sanderson-Cyclone, gasoline, well drill, is used. This employs a 5⅝-in. split type of bit weighing 200 lb., which makes a hole about 6 in. in diameter. Drilling progresses at an average rate of 5 ft. per hour, three shifts being required for the completion of two holes. Bits drill from 700 to 1300 ft. of hole before they require sharpening; and are then sharpened in an Armstrong Model 6 drill sharpener. The holes are spaced 18 ft. apart and 20 ft. back from the quarry face.

The holes are loaded with 5x16 Pyrotol cartridges, from 125 to 150 lb. of Pyrotol being used to a hole. The explosive fills the hole about one-half full. Tamping in the form of earth, or drillings, is placed on top of the explosive to within 6 or 7 ft. of the surface. Shots are fired by electricity. Little secondary blasting is necessary. Two Ingersoll-Rand "Jackhamer" drills furnished with air by an Ingersoll-Rand, Type ER1, 12x10-in. air compressor are employed to drill the holes for secondary blasting; and 40% gelatin dynamite is fired in these holes.

The broken limestone is loaded into 5-ton side-dump cars running on a 36-in. gage quarry track by a Type 50B, Bucyrus steam shovel with caterpillar tread mounting. Trains of loaded cars are hauled to the neighboring crusher house and empties are returned by means of a 20-ton, 11x16-in., saddle-tank Porter locomotive. At the crusher house the loaded cars are dumped one at a time directly into the mouth of a 20-in. Worthington, Superior-McCully breaker which reduces the limestone to a maximum size of about 4 in. A 12x30-in. Illinois pan conveyor transports the breaker product to a 36x42-in. Type R Jeffrey swing-hammer pulverizer, which reduces the crushed limestone to about 90% minus ¾-in. and a 24-in. belt conveyor carries this product to the storage building. A 100-hp. motor drives the gyratory through a belt and a 150-hp. motor drives the swing-hammer pulverizer and the pan conveyor. This plant has an average capacity of from 600 to 800 tons per 8-hour shift, but has crushed in excess of 1000 tons a shift.

The crushed limestone is recovered from

One of the older type quarry cars still in use

storage by a 6½-ton electric crane operating a 2½-cu. yd. grab bucket, which places it in the limestone compartment of a two-compartment mixing bin and puts shale in the other compartment. A mixer below this bin mixes limestone and shale in the proper proportion, and the mixture is conveyed to the

Looking down into the northwest section of the Black Hills company's quarry

cement mill proper for fine grinding and manufacture into cement.

Black Hills Marble Quarries Corp.

The Black Hills Marble Quarries Corp. was organized in 1927 and produced 18,000 tons of limestone and 1500 tons of lime in 1928. Its property consists of 580 acres on the Chicago and North Western railway, just north of the state cement plant and extending northwesterly to the holdings of the Northwestern Quarry Co. The corporation has opened a new quarry at the northern end of its land adjoining the Northwestern quarry, and has purchased the lime plant formerly belonging to the Black Hills Rock Products Co. and operated by the Dakota Lime Co., which property now forms the southern end of its holdings. C. W. Ericsson is president of the Black Hills Marble Quarries Corp., O. W. Johnson is vice-president and treasurer and G. C. Lauer, secretary.

The new quarry is opened in Minnekahta limestone of the composition shown in Analysis 4, Table 1. It is being advanced into the hillside and as yet has attained a depth of face of only 18 ft. Holes are drilled with a Denver "Clipper" drill and are spaced about 10 ft. apart and 10 ft. back from the face. Compressed air is furnished by an 8x8-in. Blaisdell air compressor driven by a 25-hp. motor. Hexagonal ⅞-in. steel is used in 2-ft. runs of ⅛-in. difference in gage. Bits require sharpening once in about 20 ft. of hole drilled. A small Sullivan drill is provided for block-holing.

The holes are first sprung with ⅞-in. sticks of 40% gelatin dynamite, then loaded with black powder (3F for crusher rock and 2F for riprap) and fired by electricity. An Erie ¾-cu. yd. steam shovel loads the broken stone into 1½-cu. yd. Western side dump cars, which are trammed by hand to the adjacent crushing plant.

When making crushed rock, the quarry cars dump directly to a No. 4 "Telsmith" reduction crusher operated by a 50-hp. electric motor. A 24-in. belt conveyor, on 213-ft. centers, transports the crushed limestone to the screen. This is a 5x20-ft. Allis-Chalmers revolving screen fitted with a 6-ft. diam. by 4½-ft. dust screen at its upper end. It revolves at 16 r.p.m., and is set on a slope of 7 deg. Conveyor and screen are both operated by one 30-hp. motor. The oversize from this screen goes by a gravity chute to a No. 3D Gates gyratory breaker operated by a 20-hp. motor, the breaker product being returned to the screen at present by a bucket elevator for which a belt conveyor is to be substituted. Below the screen are three bins with a total storage capacity of 600 tons of crushed limestone. Beneath the bins runs a 30-in. Telsmith loading conveyor operated by a 3½-hp. motor for loading cars on a railway spur, while accommodations are also provided for loading trucks. This plant has supplied crushed limestone of 1-in. and under for use as road metal, of 2-in. to ¼-in. for use in street paving and of 1¼-in. to ¼-in. for use in highway bridges.

The lime plant operated by the Black Hills Marble Quarries Corp. on the southern end of its property has already been fully described in Rock Products, and this description covers the present method of operation. E. McDaniels is foreman of the lime plant. In brief, the operation consists in mining the upper 20 ft. of Minnekahta limestone in two benches. Holes are drilled with a "Jackhamer," sprung with dynamite, and broken with black powder. The limestone is burned in one of three 8-ft. kilns using bituminous coal as fuel and about 90% of it is manufactured into hydrated lime by a Clyde batch hydrator and then sacked.

The company is planning the immediate erection of a large modern lime plant. An 8x125 rotary kiln is already on the ground as shown in the illustration and other equipment is now being purchased. The natural

Left—A section of the limestone quarry of the Northwestern Quarry Co. Right—The North crushing plant operated by the Northwestern company

*Volume XXX, No. 11, page 35, May 28, 1927.

Lime plant of the Black Hills Marble Quarries Corp.

gas pipe line supplying Rapid City crosses the property, artesian water has been developed at a depth of 187½ ft. and all the conditions appear favorable to the development of a large enterprise. Various types of clay occur on the property and in the immediate vicinity, and the erection of a brick plant is also being considered.

Northwestern Quarry Co.

The Northwestern Quarry Co. was organized in 1910 and opened its quarry in 1911. This quarry produced about 230,000 tons from 1913 to 1927 inclusive, and about 25,000 tons in 1928. It is situated four miles northwesterly from Rapid City on the Chicago and North Western railway, just north of the property of the Black Hills Marble Quarries Corp. A. S. Halley is president; Roger E. Lee, secretary, and R. H. Lee, manager. The description of this quarry given in Rock Products two years ago is now incorrect, for during the summer of 1927 the writer acted as manager for the Northwestern Quarry Co., purchasing new equipment, remodeling one crusher plant and making other minor changes.

The Northwestern quarry is opened on a hillside and developed so as to expose the full 40-ft. thickness of the Minnekahta limestone in this neighborhood in its quarry face. The character of the sugar limestone shipped from this quarry during the past two years has already been noted. In selecting sugar rock, only a small proportion of the quarry product is rejected—a porous layer at the top and a thin-bedded layer near the center of the face—so the analysis of the quarry run would be only a little more impure.

The quarry face is broken in two benches. Holes, 16 to 18 ft. in depth, are drilled with a "Butterfly Jackhamer," 100 BC4. Three-foot runs of steel differing 3/32 in. in gage are employed, requiring sharpening about once in 30 ft. of hole drilled, the rock being somewhat softer than that at the adjoining Black Hills Marble Corp. quarry. Compressed air is supplied by an Ingersoll-Rand, Type ER1, 8x8-in. air compressor run at 95 lb. pressure. Holes are spaced about as far apart and as far back from the face as they are deep. The holes are sprung twice with 40% gelatin dynamite, then loaded with 100 to 150 lb. of black powder and fired with a primer consisting of a stick of dynamite in which a No. 6 electric cap has been inserted.

The broken limestone is loaded by hand into 3¼-ton rigid quarry cars, which are hand trammed to one of two crushing plants if crushed stone is desired, or to a railroad spur if sugar limestone or riprap is to be shipped. Simple cradle dumps are used to dump to the crushers or the railroad cars. Quarry cars with enclosed roller bearings and steel side supports have replaced cars with open journals and wooden side supports.

At each crushing plant, the quarry cars dump directly to a No. 4 Gates gyratory breaker, and the breaker product is elevated by bucket elevator to the screen, the oversize returning to the breaker by a 33 deg. gravity chute. Each plant is operated by a 40-hp. electric motor. The principal difference is in the screens. At the south plant an Allis-Chalmers 32-in. by 10-ft. revolving screen is used, the first 3 ft. of which commonly carries a ¼-in. dust screen. At the north plant a 3x6-ft. Leahy "No-Blind" vibrating screen is installed, with two 3x6-ft. screens one above the other, the lower commonly being a ¼-in. dust screen. The revolving screen slopes 7½ deg. and makes 15 r.p.m., while the vibrating screen slopes at 33 deg. and makes 1600 vibrations per minute. The oversize of the vibrating screen is much freer from fines than the oversize of the revolving screen. Each of these two crushing plants has a capacity of about 100 tons per 8-hour shift.

Six Other Quarries

In the other Black Hills limestone quarries few changes have been made since they were described in my earlier article.† The limestone quarry and lime plant of the Homestake Mining Co. in the Minnekahta limestone at Calcite, near Piedmont, operated as usual during 1928, making its customary production of some 2500 tons of chemical lime for use in the Homestake mills. The analysis of the limestone quarried at Calcite appears as Analysis 6 in Table 1. This limestone has a thickness of 22 to 32 ft. at the Homestake quarry and is worked in two benches. Holes up to 20 ft. in depth are put down by hand churn drilling, three men to a drill. The holes are drilled 20 ft. back from the face, chambered three times with 1⅛-in. sticks of 40% dynamite, loaded with 16 to 20 kegs of black powder, and fired electrically, one at a time. The broken rock is hand loaded into 1-ton cars which are hand trammed to a gravity plane, which lowers the loaded cars to the lime plant and raises the empties. The limestone is burned in an 8-ft. kiln using seasoned pine wood for fuel, a 7-ft. kiln being held in reserve.

Main conveyor and crushing plant, Black Hills Marble Quarries Corp.

The quarry in Minnekahta limestone, which is most distant from that of the state cement plant in both miles and methods, is that of H. H. Lewis, 1½ miles south of Spearfish. There a quarry face about 10 ft.

†ROCK PRODUCTS, Vol. XXX, No. 11, pp. 34-35; No. 13, pp. 57-58.

in height is worked, most of the breaking being done by shooting dynamite in crevices, with only occasional resort to drilling. The limestone is high in calcium and is burned in a small kiln using wood for fuel. The production in 1928 was 1800 bushels of building lime.

The Dark Canyon Stone Co. of Rapid City is now under the management of A. M. Lanphere. It operates a quarry in the Pahasapa limestone at Dark Canyon, seven miles west of Rapid City on the line of the Black Hills, Rapid City and Western railroad. The 1928 production from this quarry was about 10,000 tons. Analysis 1 in Table 1 shows the chemical character of the limestone quarried. A quarry face of 300 ft. is worked in low benches. Holes 6 to 8 ft. in depth are drilled with sinker drills, loaded with 3 to 5 sticks of 40% dynamite, and fired with cap and fuse. The broken limestone is loaded by hand into 1-ton cars which are trammed by hand to the crushing plant. There the limestone is crushed by a No. 3D Gates gyratory breaker and screened on a 3x12-ft. revolving screen.

F. V. Redenbaugh of Pringle reports the shipment of 10 carloads of limestone last fall from his sugar rock quarry near Loring Siding on the Chicago, Burlington and Quincy railroad. This quarry is in the Pahasapa limestone, which in this locality is a high calcium limestone as may be seen from Analysis 2 in Table 1. The quarry face is 75 ft. in height. Holes are drilled with compressed air, sprung with dynamite, and broken with black powder. The broken limestone is reduced to fragments of the desired size by means of picks and stone hammers.

Several small quarries breaking and crushing limestone for use as road metal are reported to have been in operation in the Black Hills during 1928, but no details concerning them are available.

Studies of the Deval Test on Concrete Aggregates

"STUDIES OF METHODS of Making Deval Abrasion Tests of Aggregates" is a reprint of a paper delivered by Stanton Walker at the June, 1928, meeting of the American Society of Testing Materials. It is published by the society. Mr. Walker is director of the engineering and research department of the National Sand and Gravel Association but his paper is concerned as much with other aggregates as with gravel. Its purpose is to show that the method of making the Deval test is the important factor in the results obtained.

In the introduction the paper says that "the studies which have been carried out have generally failed to indicate any definite relationship between the resistance to abrasion of an aggregate and the resistance to abrasion or the compressive strength of concrete." From the showing of the effect of different variables in making the test it would also seem that the resistance to abrasion disclosed by the test has no very definite relation to the density of the specimen tested. Concerning this the paper says: "Probably the relationship is so complicated by the varying combinations of impact and abrasion in the test that it will be difficult to establish."

The variations studied were: (1) Effect of number of revolutions of the cylinder in which the samples are tested; (2) effect of the weight of the sample taken; (3) effect of the number of cast-iron balls added as an abrasive charge; (4) effect of the grading of the sample; (5) effect of the shape of the pieces tested.

Discussing the first of these it is shown that the number of revolutions and the wear have a "straight-line relationship" on hard materials. On softer materials the plot is a decided curve, showing the cushioning effect of the fine particles and dust produced.

The effect of the weight of the sample is shown to be very pronounced. For the three aggregates tested, gravel, limestone and slag, the percentage of wear varied from 14% to 25% with a 2000-g. sample, while with a 7000-g. sample the wear varied only from 4.7% to 5.7%. In other words, the large sample shows not only less wear, but much less difference in wear between different aggregates. The paper rasies the question as to whether the 5000-g. sample used in the standard Deval test is too large.

The effect of the number of balls used is shown to be similar to the effect of the number of revolutions.

The effect of the grading of the sample is the most important of all, to judge by the figures and the diagrams in the paper. The percentage of wear was increased from 1.5% to 7.5% by increasing the fines in gravel from 0% to 50% and a similar relationship was established with crushed limestone. Fifty-seven different gradings were tested and plotted and it was shown that the same percentage of wear could be obtained from many gradings. Just what makes grading so affect the percentage of wear has not been determined but the paper notes that the curves indicating the percentage of wear are similar to those indicating percentage of voids.

Regarding the shape of the pieces tested, it is shown that the wear is less after the angular portions have been removed.

The paper draws several interesting conclusions regarding the Deval test but it does not point out any methods by which the standard test used on stone or the Rea modification used on gravel may be particularly improved. In fact reading the paper leaves one in doubt of the practical value of the abrasion test as applied to aggregates. This feeling is increased by reading the discussion of the paper by F. H. Jackson of the United States Bureau of Public Roads. Mr. Jackson appears to prefer the static load test used in Iowa and the impact test developed by the Bureau of Public Roads to determine the number of soft pieces, which, as he says, "is after all the vital thing." He also mentions Ohio concrete roads made of gravel that showed a high percentage of wear in the abrasion test but which are in excellent condition after years of service.

The tests from which the data were taken were made at the laboratory of the Portland Cement Association while Mr. Walker was with the association and are used with the association's permission.

Amendment Regarding "Trade Secrets" Asked by Federal Tariff Commission

THE Tariff Commission has submitted to the house committee on ways and means a proposed amendment to section 318, of the tariff act of 1922, designed to clarify the interpretation of "trade secrets" as used in section 708, of the revenue act of September 8, 1916. The letter is signed by the chairman of the commission, Thomas O. Marvin, under date of April 16.

Section 708 makes it unlawful for any member or employe or for any employes of the United States "to divulge or make known in any manner whatever not provided for by law to any person, the trade secrets or processes of any person, firm, copartnership, corporation or association embraced in any examination or investigation conducted by said commission or by order of said commission or by order of any member thereof." It also has penalizing provisions.

Chairman Marvin says in part in his letter to the committee:

"It has been the practice of the tariff commission to regard costs of production of individuals and of firms and corporations in the nature of 'trade secrets,' which under section 708 shall not be divulged. There is also information secured by the commission under agreement to regard it as confidential. The proposed amendment will make the situation clear and will definitely establish the procedure which the commission has found necessary.

Such proposed amendment ro provision could be added most suitably at the end of the subdivision (c) of section 318 of the tariff act, to read as follows:

"Information secured by the commission or by any of its members, agents or employes, with respect to conversion costs or costs of production of any person, firm, copartnership, corporation or association and other information treated under the provisions of this act, shall be regarded as trade secrets or processes for the purposes of section 708, of the revenue act of 1916, and shall not be published in such form as would divulge or make known such costs or such confidential information as relating to any particular person, firm, copartnership, corporation or association."

Estimations of Water Requirements and Flows

For Aggregate Washing Plants, Silica Operations and Other Uses in the Rock Products Industry

By Edmund Shaw
Contributing Editor, Rock Products

EXCEPT in the larger operations the writer has found that the men who are in charge of concrete-aggregate washing plants do not often know how much water is used in them. Possibly this is so because at the start the plant is placed where there is enough and some to spare for all the aggregate that the plant can sell. But it often happens that the market grows and there is a demand for cleaner material and this calls for more water, a re-use of water or a more economical use of water. In such case the whole matter of water supply and use has to be gone into and it would often save a lot of time, money and trouble if the information was obtained in advance of the need.

Knowledge of the water used in a plant is also needed to design and install sand settlers and other washing devices, and these sometimes fail because they were not of the right size for the water they have to handle. While the writer was designing and selling such devices his hardest job was to find out how much water was to be handled. It was the first question asked an inquirer and the usual answer was something like: "We use a 6-in. pump"; or perhaps, "We have a 4-in. pump with a 25-hp. motor"—information so indefinite as to be worthless, for a centrifugal pump will deliver anything from zero up to its limit, according to the conditions under which it is working. For these reasons it was thought an article describing easy methods of measuring water flows would be appreciated by plant operators. The descriptions will be the simplest, and only the simplest formulas will be used, for the article is not addressed to engineers and those who have studied hydraulics.

The methods may be divided into three classes: Metering; finding the rate of flow, and calculation from a theoretical basis. Metering (used here refers to recording instruments) is used in rock products plants only when the water is purchased and a check is needed on the monthly bills. Knowledge of recording meters is outside the ordinary plant man's equipment, and the writer knows no more about them than what he has read, except the simple tilting meter which he has made and used. But this is only applicable to metering small flows so it will not be described here. The Pitot tube and the Venturi meter cannot well be used in water containing much gritty or clayey material, so they are barred from plant use. Those interested can find full descriptions in any good textbook on hydraulics.

Measuring in Tanks and Flumes

The simplest way to measure a water flow is to run it into a measured tank for as many seconds or minutes as it takes the tank to fill. It can be done oftener than one would think if a little trouble is taken to fit up a bin or a sand tipple to receive the water. The tank need not be absolutely water-tight, for the leaks can be taken into account by noticing how far the water level in the tank drops in a minute, and adding *half* this

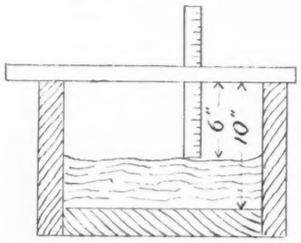


Fig. 1. Determining the quantity flowing in a rectangle flume. This illustrates correct method of finding depth of the water

amount, multiplied by the time it took to fill the tank, to the contents. Taking half the amount is a rough way of averaging the head over the leaks in filling. The measurements of the tank should be carefully made, and if the flow varies much several fillings should be made. If the time of filling is a matter of minutes any watch will do, but if it is a matter of seconds a stop watch must be used. The calculations necessary to find the flow are too simple to be worth putting down.

In point of simplicity, finding the flow in a flume comes next. All that one has to do is to find out how far a chip will float in a second and multiply this by the cross-sectional area of the stream. To get any kind of an accurate result there must be a straight run of the flume for some distance, 25 ft. or, better, 50 ft., and the current must not be too swift. Usually one can find a place to make the test in the flume that carries away the tailings and used wash water of the plant. Unless the current is very slow it requires two persons to take the time accurately, one at the upper end of the run to call "time" when he drops in the chip, and the other at the lower mark to note the time when the chip passes it. The cross-sectional area has to be taken by measuring down from the top of the flume to the top of the water at several places, for it is impossible to find the depth by putting a stick in the water or measuring at the end of the flume. Of course all the measurements must be made in feet and decimals if the answer is wanted in cubic feet and in inches and decimals if it is wanted in cubic inches.

A correction has to be made because the velocity of the stream as shown by the floating chip is the center velocity and not that of the entire stream. It is customary to take five-sixths, or 83%, of the center velocity of the whole stream, which is close enough to use with flumes of ordinary shapes, but this would not do for the velocity in a broad, flat flume or even an apron.

The area of the cross-section multiplied by the velocity equals the quantity flowing in a unit of time, and is generally written, $Q = Av$ (quantity equals area times velocity). It is a simple but very useful formula, because from it we get the other relationships, $v = Q \div A$ (velocity equals quantity divided by area) and $A = Q \div v$ (area equals quantity divided by velocity). These relationships are needed in finding how large a flume or a pipe is required to carry a certain amount of water, and they can be used with some allowances for short pieces of pipe or flume and rough calculations. For more exact work formulas which give corrections for friction and other things that lessen the flow have to be used.

The following is an example showing how the quantity flowing in a rectangular flume is found: The time required for the chip to pass 50 ft. of a flume 10 in. deep and 16 in. wide (inside) is 8 sec. The water is 6 in. down from the top of the flume. How many cubic feet pass in one second?

$50 \div 8 = 6.25$ ft. per sec. velocity. This is v.

$10 - 6 = 4$, the depth of the water in the flume in inches, which is one-third, or 0.333 ft. The width is 16 in., or 1.333 ft., so the cross-sectional area is $0.333 \times 1.333 = 0.444$

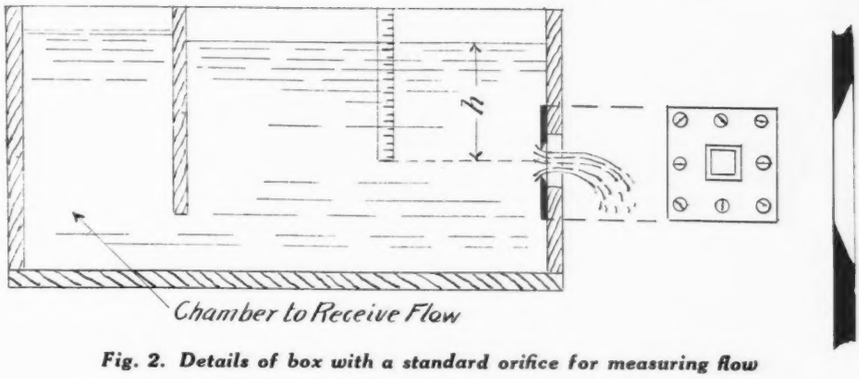


Fig. 2. Details of box with a standard orifice for measuring flow

sq. ft. This is A.

Then as $Q = Av$, the quantity flowing in one second will be $0.444 \times 6.25 = 2.775$ cu. ft. per sec.

As there are 7.5 gal. in a cubic foot (about) and 60 sec. in a minute, the gallons per minute (g.p.m.) in this flow will be $2.775 \times 60 \times 7.5 = 1249$.

Sometimes the flow of a natural stream, the source of water for the plant, is needed. The flow is found in the same way, but the measurements must be taken more carefully, as the banks and bottom are irregular and a straight run of any length cannot often be found. So the velocity is taken not only in the center of the stream, but at the sides and at points between, evenly spaced. The average of these velocities is considered to be the velocity of the stream at the surface, but as the velocity at the bottom is less, the same correction should be applied to get a safe estimate. Engineers get the average velocities with submerged floats, or with current meters, and estimate the flow directly from them. Any book on hydraulics will give this method in detail. Those not familiar with such work will probably get a closer result by putting in a weir, as will be explained later, or, in cases where it can be done, running the stream through a box with a measured orifice.

Measuring the Flow With a Standard Orifice

The box with a standard orifice is as accurate a method as the ordinary man can use, and the results will be within 3% of the current flow if the box is well made and the work is carefully done. It must be large enough to take the flow, and a chamber to receive the discharge should be cut off at one end so as to get rid of air bubbles and surging as much as possible. For measuring the flow of a centrifugal pump throwing 3000 to 4000 g.p.m., the box should be about 10 ft. long and have a 4-ft. chamber, cut off by a baffle, to receive the discharge. The orifice should be at least three times its diameter from the sides and bottom. It is made by cutting a hole in a piece of plate which is fastened to the box with bolts or screws and a gasket. The hole may be either round or square, but the edges should always be filed to sharpness. If care is taken to make the hole exactly square and as close to some definite dimension as possible (as 6 in. square or 9 in. square), it will save trouble in calculating.

The flow is estimated from the height of the water above the center of the orifice, called h, or the head, and to read it easily a scale may be marked on the side of the box. The flow is figured by a second simple formula which has many uses, $v = \sqrt{2gh}$. (The expression $2g$ is the acceleration given a falling body in one second, equal to 64.4 ft.) This gives the velocity due to the head and having the velocity the quantity discharged can be found as before by $Q = Av$, A being the size of the orifice in square inches.

A correction has to be made because water flowing out of an orifice contracts as it passes the edges as shown in the illustration and it is only at the contracted part of the stream that the velocity is equal to $\sqrt{2gh}$. The contracted area may be anything from 59.7% to 62% of the size of the orifice, depending on the head. It is common to take 60% as an average figure, but some take 61%, and the writer thinks this preferable. This correction factor, whatever its value, is written as C. The formula for the velocity then becomes $v = C \times \sqrt{2gh}$. We can simplify it by writing $v = C \times 8.025\sqrt{h}$, as 8.025 is the square root of 64.4, and if we say that $C = 0.61$ (61%) we can write that $v = 0.61 \times 8.025\ \sqrt{h}$, or $4.9\ \sqrt{h}$.

As an example of how it is used: The height above the center of the orifice, h, is measured at 11.6 in., and the orifice is 6 in. (0.5 ft.) square. What is the velocity and the quantity flowing through the orifice?

We can extract the square root of 11.6 (h) by the arithmetical method or we can find it on a slide rule or in one of the tables that every engineers' hand-book and many trade catalogs contain. Using the table, we find the square root of 11.6 to be 3.41. Applying the simplest formula, we have $v = 4.9 \times 3.41 = 16.709$ ft. per sec. Having the velocity, the quantity for one second is found as before, by $Q = Av$. A of course is the size of the orifice, 0.5×0.5, or 0.25 sq. ft. Hence, 0.25×16.709 equals the quantity, 4.177 cu. ft. per sec. This may be converted to gallons per minute by multiplying by 7.5 as before.

Boxes with short pieces of pipe inserted and with pipes sticking inside for a short distance have been used for measuring, but they are not recommended. They take different values for C, and there is a wider variation in the value than with the standard orifice described. Books on hydraulics will explain this further if the reader cares to go into it.

Measuring Flow Over Weir

Weirs are used more in measuring the flows of large streams than for measuring water in plants. But there is one plant flow that is very easily measured by them—the overflow of a sand-settling tank. This overflow in its usual form is a weir, so that it is not necessary to use a box or anything else to measure such a flow.

There are several kinds of weirs besides the simple rectangular form, the notched weir, the trapezoidal form, and a curious form with curved sides that can be read directly—that is, without computation. But the writer has never seen any of them used in a plant and does not see how they could be easily applied to plant work.

There are several formulas for finding the flow over the weir, but one that is much used is $Q = 3.33L\ (H + \frac{1}{4}h)^{3/2}$, in which L is the length of the weir, H the height of the top of the water above the weir and h a head figured from the "velocity of approach," the velocity with which the water flows to the weir. For rough work this may be disregarded and the formula written

$$Q = 3.33LH^{3/2}$$

which is called Francis' formula.

There are tables which give the flow according to this formula in many engineering hand-books. In Marks' hand-book there is a scale that can be read easily and quickly, and footnotes show the corrections that are to be made for various conditions. The writer has used it a great deal in working with classifiers and sand settlers, and the re-

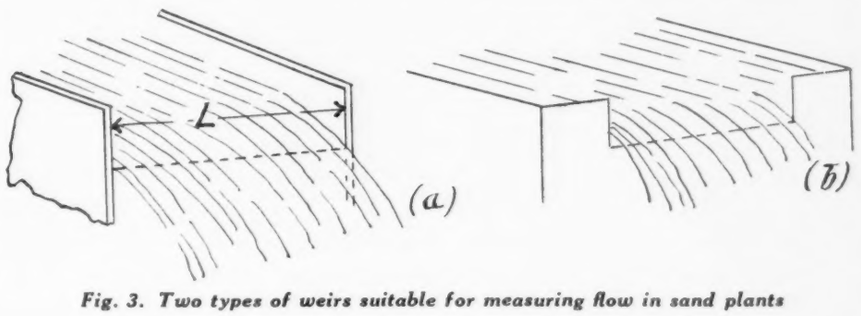


Fig. 3. Two types of weirs suitable for measuring flow in sand plants

sults were always close enough for practical purposes.

Lacking such a scale or table, one may use the table of 3/2 powers of numbers found in many hand-books, or use an ordinary table of logarithms or a slide rule. But weir measurement is of so little use in plant work that it does not seem profitable to discuss it further here.

Calculation of the Flow in Pipes

The calculation of the flow in pipes and ditches belongs rather to the design of plants than to the estimation of the water used in them. That is, such calculations are needed where it is wanted to know how large a pipe must be used for a given flow. But sometimes there is no easy way to measure the flow and calculation can then be resorted to for a result which may not be correct but which may be accurate enough for what is needed.

The general formula for the flow in pipes is $v = \sqrt{2g(h - \text{lost head})}$. The lost head is made up of the entry head, the head required to make the water go into the pipe, and two kinds of friction. The easiest way to find the lost head is to look it up in one of the tables found in hand-books and trade catalogs. It varies with the velocity and the kind of pipe and its condition and these are taken into account in making the tables. There are also diagrams from which the lost head and other relationship may be read off without calculation.

Without the tables the flow must be calculated from a formula. Many formulas for the flow in pipes have been worked out in the past. The writer recently collected six from various books that were standard not so long ago, but have now become obsolete. The one that remains, which is best adapted to pipes of ordinary lengths found in plants, is:

$$v = \sqrt{\frac{2gh}{1.5 + f\frac{l}{d}}}$$

In this h is the head, or the pressure converted into feet,* d the diameter of the pipe in feet, and f is a variable factor, generally taken as 0.02 as the start. For close work a second value of f is taken after the velocity has been figured with the value of 0.02, the new value being figured from a formula or taken from tables. But such close work as this is not needed where a rough estimation of the flow is all that is wanted.

Corrections must be made for elbows and tees in the line. The writer has always added 15 times the diameter to the length of the pipe for each elbow, but this is not enough according to some authorities, who say that 30 diameters should be added for each elbow and 60 for each tee. No correction need be made for long radius elbows and bends.

The calculation of flows in long pipes and ditches, such as are used to bring in water from a distance to the plant and for pumping dredge discharges through long lines, is made by a different formula. As such lines and ditches are expensive, they should be designed by an engineer who has had experience in such work.

*A pound pressure is equal to 0.433 ft. of head. Scales and tables for conversion are given in many hand-books.

Solids in the Stream

Solids in the stream do not interfere with weir measurements, or measurements in a flume, but the box with a standard orifice cannot be used with solids that settle quickly. Clay and fine sand in the water do not interfere except that the box has to be cleaned out occasionally when they are present.

One of the reasons for measuring the flow from the plant is to find the tonnage of solids leaving the plant. To find this a sample must be taken and weighed to find its specific gravity. This is easily found by dividing the weight by the weight of the same volume of water. A bottle holding a quart or so will do for the test. Supposing that the water in the full bottle weighs 20 oz. and the contents of the same bottle filled with pulp weighs 24 oz., then the specific gravity will be 24 ÷ 20, or 1.20.

Having the specific gravity, the percentage of solids is found by the following formula:

$$p = \frac{100s\,(a-1)}{a\,(s-1)}$$

In this, p equals the percentage of solids, a the specific gravity of the pulp, and s the specific gravity of the solids in the pulp,

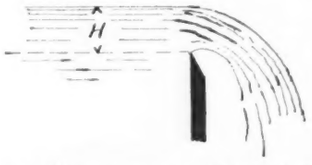


Fig. 4. Measurement of flow of water over a weir, showing how the dimension h is taken

which may be taken as 2.60 for most sands and gravels. Supposing that we have found the specific gravity to be 1.20, as above, and substituting this for a and 2.6 for s, we would have by the formula:

$$p = \frac{100 \times 2.60 \times (1.20-1)}{1.20 \times (2.60-1)} = \frac{52}{1.9} = 27.1.$$

The sample then contains 27.1% of solids.

It is not safe to trust to one or two samples as the percentage of solids varies so much in any plant flow. It is better to take samples every minute for an hour at a time, when conditions are about normal, than to trust to irregular sampling. It makes a lot of work to figure out so many samples by the formula; but it is easy to make a table and if the same bottle is used for weighing all the samples the table can be made so that the weight of the samples will show the percentage of solids without any figuring.

As an example of how the methods which have been described can be applied, it will be supposed that a dredge pump is to be studied. We want especially to know the percentage of solids in the pump discharge to see if the pump is pumping too much water for the sand and gravel carried. In such a test we shall probably want to know the horsepower used and some other things such as belt loss, but these need not concern us here.

From the car weights we find that in one hour 110 tons of gravel and 100 tons of sand were loaded. We estimate the water that drained off the gravel to be 25%, or 27.5 tons. We estimate the water drained off with the sand to be 43% or its weight, or 43 tons. The box with the standard orifice has been used to determine the flow of water to waste every minute, and the average is a flow of 10.5 cu. ft. per second. The average of the samples taken shows the pulp (waste water) has a specific gravity of 1.06, which gives by the formula just quoted 9.6% of solids. (For the sake of simplicity it is assumed that no wash water is added to the pump discharge.)

As the specific gravity is 1.06, one cubic foot of the pulp would weigh 1.06 × 62.5, or 66.25 lb. And as the flow was 10.5 cu. ft. per second, the flow for one hour would be 37,800 cu. ft. And the weight in tons for one hour would be 37,800 × 66.25 ÷ 2000, which is 1250 tons. Of this we know that 9.6%, or 120 tons, is solids, fine sand and clay going to waste.

The weights of water and solids, then, are:

	Solids, tons	Water, tons
Gravel	110	.....
Water with gravel, 25%	.....	27.5
Sand	100	.....
Water with sand, 43%	.....	43
Clay and fine sand to waste	120	.....
Water to waste (1250 — 120)	.....	1130
Totals	320	1200.5

The sum of these is 1520.5 tons, of which 320 tons is solids, so the percentage of solids is 21%, which shows that the pump is doing fairly good work.

Use of Slag Ballast for Railways

THIS symposium, designated as No. 9, and published in 1928, is one of a collection pertaining to the characteristics and uses of blast furnace slag. It is prepared by the National Slag Association, 937 Leader Bldg., Cleveland, Ohio, of which H. J. Love is secretary-treasurer.

A summary in 1920 showed that 48 railroads in the eastern half of the United States used slag for ballast, absorbing 1,422,000 tons for this purpose. A similar review in 1926 showed 1,000,000 tons were used in New York, Ohio, Pennsylvania, Kentucky and West Virginia alone. Alabama used 275,000 tons and the Southern roads adjacent to Birmingham used 1,720,000 tons. The total slag production of the United States is given at 20,000,000 tons, of which roughly 25% goes for ballast.

Rationalization of Shaft Lime-Kiln Design—Part II

Performance of Various Kilns Compared

By Victor J. Azbe
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IN THIS SECOND PART (the first part was published in ROCK PRODUCTS, April 13, 1929) the performance of 17 different kilns will be discussed. While most of these kilns are located in the United States, a number are in Germany and others in England and Belgium. The size of these kilns is extremely varied, the largest of them has a size 20 times greater than the smallest. The highest capacity is 112 tons per day, while the lowest is only 8 tons. For a given kiln size, one kiln makes 15 times as much lime as another. There are also other differences; some are of the mixed-feed type, others are either gas- or direct-fired; some use large, others small, stone; in some the lime burned is of the high calcium variety, in others dolomitic or even hydraulic; some of the kilns are natural-draft operated, others operate under induced draft or under very high intensity forced draft; some of the kilns are twice as high as others; one has a shaft of 26-ft. diameter, or 540 sq. ft. area, while another has a shaft of only 30 sq. ft.

Fundamental Laws Governing Kiln Performance

To enable one to understand these extreme differences, it is first necessary to become posted on certain fundamental laws governing kiln performance. How will the small piece limestone behave in the kiln compared with the large piece; what happens when gas velocity through the kiln is increased, or if the stone is uniform or ununiform? Therefore, a careful study of the following is quite necessary if one desires to interpret kiln behavior:

1. The smaller the stone size the greater the surface available for absorption of heat. Surface ratio to weight increases directly as the size. An 8-in. stone cube will have only half the surface per pound of weight as a 4-in. stone cube.

2. The layer of lime on a lump of limestone obstructs heat flow to the limestone. Conductivity of lime is only 27% of that of limestone. The larger the stone, the thicker the lime layer the heat has to penetrate to the core to be burned.

3. Due to reduction of surface and increase of impedance to heat in flow, the time required for burning increases very rapidly as the size of stone increases. Doubling the size increases the time about 3½ times. If a 5-in. sphere of stone requires 2 hours to become preheated and calcined, then under the same surrounding temperature conditions a 10-in. sphere of limestone will require 7 hours.

4. With uniform stone of any size the voids are about one-third, so only two-thirds of the kiln shaft is stone, one-third being filled with gas. Of this one-third not all is available for a gas channel, the actual amount being probably about one-fourth of the shaft cross-section. A kiln shaft of 50 sq. ft. area will have a free gas path of 12.5 sq. ft.

5. The free gas path will be the same for small as well as for large stone, but with the small it will be divided up into many smaller channels, while with the larger stone into a few large channels. Velocity in either case will be the same, but the friction to the flow of gas will be greater with the small than large stone, because the gas friction depends upon the amount of surface exposed to gas flow. Friction varies inversely as the square of stone size, and so will be about four times as much for 5-in. as it is for 10-in. Reducing the stone size should reduce the kiln output unless the draft is increased by some means, best by a mechanical method.

6. Gas friction also varies with gas velocity, and for the same gas temperature the variation is as the square of gas velocity. Doubling the velocity quadruples the friction. If a kiln operates with ½ in. of natural draft, for double the capacity the draft would have to be 2 in., of which the additional 1.5 in. can be only obtained by mechanical means.

7. Gas friction further varies inversely as the absolute temperature. For a given velocity, if absolute temperature is doubled, friction is reduced to half. This is the same as stating that gas friction varies directly with the density of the gas.

8. The higher the gas velocity, the higher the heat transfer. While friction varies as the square of velocity, heat transfer varies as the square root of velocity. Friction goes up faster and progressively faster, while heat transfer goes up slow and progressively slower.

9. The less the diameter of the gas channel, the higher the heat transfer for a given velocity. With small stone, for equal velocity, which means equal capacity, heat transfer will be higher and so efficiency greater.

10. Hydraulic lime, because of its lower percentage of $CaCO_3$, requires less heat for decomposition; further, its conductivity, due to the greater density of the burned lime, is greater; impedance to heat in flow is less. Hydraulic limestone, therefore, is much easier burned than high calcium limestone.

11. Magnesium limestone or dolomite also burns with much greater facility than high calcium limestone. The reason is that magnesium carbonate decomposes at much lower temperature than calcium carbonate. The magnesium carbonate is converted to magnesium oxide, so to speak, with heat that is not usable for calcium carbonate decomposition—heat that on this account would have been wasted in a high calcium lime kiln.

Taking these together, the conclusion is:

A—With small stone the surface will be much larger and the heat will be absorbed much faster, and the kiln efficiency should be somewhat higher, but the draft necessary will be greater for the same capacity. The only advantage would be a somewhat higher efficiency, which on the other hand may be counteracted by less uniform gas distribution with small than with large stone. The possible advantages of small stone are not realized until the capacity is increased more in proportion to the increased surface of the small-sized stone. When this is done, however, due to a combination of influences, the draft drop is very greatly increased, and the power cost of mechanical draft becomes an item for consideration.

B—With large-sized stone a high capacity is readily possible with comparatively low draft, but then large kilns are needed or fuel efficiency becomes impaired.

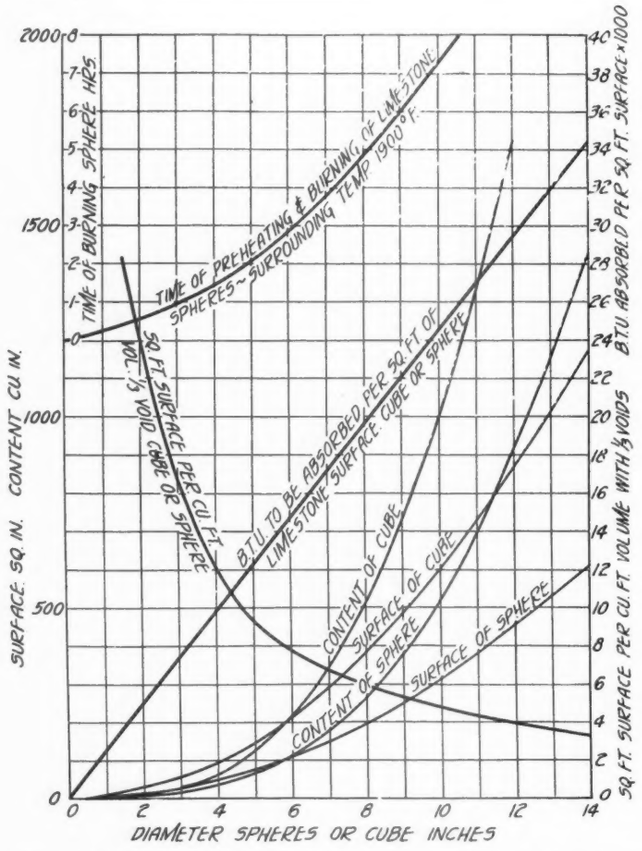
C—Burning mixtures of large and small stone is inadvisable; first, the small stone fills the voids between the large stone, and, second, the small, half-size stone burns three-and-a-half times faster than the large, full-size stone, so uniformly burned lime under these conditions is not obtainable. The capacity is lowered by clogging the kiln, and because the drawing is retarded by waiting for the core in the larger lumps to become burned, making of large portions of the hot zone ineffective by the presence of already burned small lumps, that cannot be withdrawn due to the large unburned lumps.

Following is a tabulation of the various

quantitative characteristics of different size stone spheres and cubes. In Fig. 1 some of these same data are presented in graphical form:

CHARACTERISTICS OF DIFFERENT SIZE SPHERES OR CUBES OF LIMESTONE

Size of sphere or cube (in.)	2	4	6	8	10	12
Surface of cube (sq. in.)	24	96	216	384	600	864
Number of cubes per sq. ft. of surface	6	1.5	.66	.37	.24	.166
Surface of sphere (sq. in.)	12.5	50.2	113	201	314	453
Number of spheres per sq. ft. of surface	11.5	2.87	1.27	.72	.46	32
Content of cube (cu. in.)	8	64	216	512	1,000	1,728
Weight of cube (lb.)	.73	5.85	19.75	46.8	91.5	158
Content of sphere (cu. in.)	4.19	33.5	113.4	268	523	905
Weight of sphere (lb.)	.38	3.06	10.37	24.6	47.8	82.7
Heat per cube for preheating and decomposition (B.t.u.)	819	6,555	22,100	52,400	102,500	177,000
Heat per sphere for preheating and decomposition (B.t.u.)	426	3,420	11,620	27,550	53,600	92,600
Number of cubes per cubic foot (one-third voids)	144	18	5.3	2.2	1.15	.666
Number of spheres per cubic foot (one-third voids)	275	34	10	4.3	2.2	1.27
Surface per cu. ft. of spheres or cubes (sq. ft.)	24	12	8	5.9	4.8	4
Heat to be transferred by sq. ft. of sphere or cube surface (B.t.u.)	4,900	9,820	14,770	19,700	24,600	29,600
Heat to be transferred per cu. ft. sphere or cube (one-third voids—B.t.u.)	117,500	117,500	117,500	117,500	117,500	117,500
Ratio: Heat / Surface	1	2	3	4	5	6
Relative time of burning (Haslam and Smith)	1	2.9	5.7	9.7	14.6	21


TIME OF PREHEATING & BURNING OF LIMESTONE SPHERES ~ SURROUNDING TEMP 1900° F.
TIME OF BURNING SPHERE HRS
SQ. FT. SURFACE PER CU. FT. VOL. 1/3 VOID CUBE OR SPHERE
B.T.U. TO BE ABSORBED PER SQ. FT. OF LIMESTONE SURFACE CUBE OR SPHERE
CONTENT OF CUBE
SURFACE OF CUBE
CONTENT OF SPHERE
SURFACE OF SPHERE
SURFACE SQ. IN. CONTENT CU. IN.
B.T.U. ABSORBED PER SQ. FT. SURFACE ×1000
SQ. FT. SURFACE PER CU. FT. VOLUME WITH 1/3 VOIDS
DIAMETER SPHERES OR CUBE INCHES

Characteristics of different size spheres or cubes of limestone

Discussion of the Chart—Dimensions and Performance Factors of Various Lime Kilns

The order of arrangement of the various kilns on the large kiln chart is such that mixed-feed kilns are first, followed by gas-fired kilns, then direct-fired, and finally oil-fired kilns. While considerable cross comparing will be necessary, still an effort has been made to place kilns of some related interest adjacent to each other. The start should not be made with the first kiln tabulated, but rather with Kiln XIV, an American, direct-fired kiln located in Tennessee and particularly poor in performance, as compared to size. In this way a standard for comparison is established, the lower standard in this case, from which one can gage upward.

Kiln XIV

While this kiln is not very small as American kilns go, the output is, however, one of the lowest; only 8 tons of high calcium lime were made per day. The output per square foot of shaft area was only 355 lb. and per cubic foot of kiln space less than 7 lb. per day. Kiln gas velocities were so sluggish that it took the gas 31 seconds to work up through the shaft and storage zone, a height of 29 ft. The heat absorbed per square foot of limestone surface was only 95 B.t.u. per hour; a poor performance.

Evidently the fault here was improperly designed fuel-burning equipment; not enough heat entered the kiln to keep the shaft filled out with gases passing upward at fairly high velocity. It is unreasonable to expect the gas to flow at 2.4 ft. per sec. in the shaft and only 0.45 ft. per second in the storage zone; under these conditions the gas short-circuited up the kiln, leaving spaces in the kiln to which the heat did not penetrate. Rather likely, due to the chimney effect, most of the gas flowed up the hot portion of the shaft rather than up the cool portions where it was most needed. Since the kilns were not arranged so they could be properly drawn and punched, there was burned in the kiln lime that could not be taken out, because there was lime with core on about the same level. It is difficult even to imagine a more unsatisfactory combination of circumstances than this kiln had to operate under.

Mixed-Feed Fired Kilns
Kiln I

This is a German, mixed-feed kiln burning rather small stone with coke breeze for fuel. The surprising thing is that this kiln was very little larger than the one previously described, and in spite of small stone and coke breeze it was making 80 tons of lime per day, fully 10 times as much as the kiln just described. While in the Tennessee kiln a piece of limestone required over 8½ days to get through the kiln, a similar piece in this German kiln got through in less than a day. The Tennessee kiln burned man-size stone, this German kiln burned material from 4-in. down to almost nothing, and in addition the spaces between the rock were clogged with coke breeze. With the same stone and fuel the Tennessee kiln would not have made 8 tons, but rather likely no lime at all, while this German kiln made 80 tons per day.

As was stated in the introduction, small stone presents more surface and less resistance to heat in flow. According to Haslam and Smith, to burn 10-in. stone requires almost ten times as much time as for 2-in. stone. While a 10-in. sphere of lime has a surface of 4.8 sq. ft. per cubic foot of kiln, 2-in. spheres would give a surface of 24 sq. ft. per cubic foot of kiln. Of course, the stone in the kiln is not in spheres, but that doesn't matter; the comparison is good, anyway.

However, while from capacity standpoint small stone has all the advantages, this is so only if the draft is sufficient. Lime cannot be made except as fuel is burned, no matter how ideal the conditions are otherwise. To burn the fuel, air is needed, and if obstruction to its movement is great, then the force necessary to create draft must be great. This is the explanation of the high capacity of the German kiln; it had a strong draft mechanically produced, with which advantage could be taken of the small stone characteristics. This kiln was further helped somewhat by

the fact that the stone was mildly hydraulic; it burned easier, but this tendency is slight compared with the very startling differences in capacity.

Kiln II

This kiln, located in Belgium, is the largest kiln the writer has ever encountered; and it probably is the largest kiln in the world. The shaft is 53 ft. high and 26 ft. in diameter. Of course, no other but a mixed-feed kiln of this size could be satisfactorily operated. The output is very high, 112 tons per day, but when compared with the kiln size, its efficiency shrinks tremendously. Kiln I, previously mentioned, had a size only a tenth of this and was making 80 tons per day. However, it is not so much kiln size that counts as heat-absorbing surface. This Belgian kiln, although ten times the size, due to its much larger stone, has an exposed stone surface only 3½ times as great as in the case of the German kiln. Then the draft was produced with a chimney, and chimneys are not of much account as draft producers for a stone-clogged kiln; further, of the draft that was produced much was lost because of air leakage into the kiln through the charging doors at the kiln top. Then again, while mixed-feed kilns naturally burn more uniformly, due to fairly uniform fuel distribution, correct drawing of lime from a shaft 26 ft. in diameter appears to the writer an impossibility.

Kiln III

This kiln is located in England. It is another monster, if not a monstrosity. The shaft is 40 ft. high, which is quite conventional. Its horizontal dimensions are, however, 10 ft. wide and 50 ft. long. The shaft is almost as large in area as that of the Belgian kiln; however, its output proportionately is much less. The capacity per cubic foot of total kiln space is even less than that of the Tennessee kiln, 5.84 lb., as compared to 6.95 lb. per day.

The excuse here is that this kiln was built many years ago, when even less was known about lime kilns than is known today; also bituminous coal is burned for fuel, which is very natural for a mixed-feed kiln; however, that should not affect capacity to any extent.

Kiln IV

This is another German, mixed-feed kiln of high capacity, and while quite interesting in many respects, is not particularly outstanding. However, there are extremes in everything, and one is inclined to feel that this kiln is a compromise; the capacity is good, although not extremely high; the draft required, not excessive; and rather likely the lime obtained is better than that from kilns forced to extreme.

Kiln V

This German kiln takes the record for capacity. It is not exactly a lime kiln. It is used for purposes of sintering, that is, dead-burning dolomite; but that operation is practically the same as lime burning carried to excess. The shaft is small, the kiln is not high, the stone while smaller than normal stone is not as small as that of Kiln I; still, the output is 85 tons per day. Stone goes through the kiln in 0.8 of a day; the average gas velocity in the kiln is in the neighborhood of 15 ft. per sec. The air combines with the coke and escapes out of the kiln in less than 4 sec. time, and our Tennessee kiln requires 31 sec. What is more, the gas gives up more of its heat in these 4 sec. than it does in eight times that length of time in the Tennessee case. Of course, forced draft is employed, air is blown up through as in the case of a blast furnace; if the kiln had been charged with iron ore it would almost be a blast furnace.

Kiln VI

This kiln probably should not have been included in tabulation; its performance is too remarkable. While the kilns are low and small in diameter the output is very great, tremendous in fact considering the size. The efficiency also is remarkable if both low height and high capacity are considered. However, this kiln does not burn ordinary lime, it burns hydraulic lime containing only about 65% CaO; the balance is silica, 22%; alumina 11%; iron oxide 3%; with small quantities of other matter. Limestone such as this will naturally require much less heat, and the burned layer being less porous will conduct heat faster into inner regions of a lump of stone, so this in a way explains the otherwise impossible results.

Gas-Fired Kilns

With this the description of mixed-feed kilns terminates, it is apparent that by knowing only the capacity of a kiln, one is unable to judge its performance. It is important to know also the size of a kiln and the kind of limestone that is burned and what is the size of the stone, and what the draft conditions are. What we learn from these mixed-feed kilns is that small stone—that is spalls—can be burned if the draft is sufficient. In fact, with proper draft they can be burned with greater facility than the normal sized stone. We also learn that if there is draft to cause air movement, and if at the same time fuel is present, and stone surface to absorb the heat, then almost unbelievable kiln capacities are possible.

Kiln VII

This German gas-fired kiln, with its 50-ton capacity for a shaft area of only 60 sq ft., is very interesting. It is one of the highest capacity kilns of its kind encountered by the writer. The output based on the cubical content is also very good, much better than it appears because the large storage zones are always in large part inactive. It is on this account that the grading of the performance of a kiln should preferably be done on square foot shaft area bases; and any kiln that has, as this one has, an output of around 1600 lb. of high calcium lime per day per square foot of shaft area, should be considered a good producer. Of course the height is of importance also.

Kiln VIII

This is an English kiln and one of the most interesting gas-fired kilns. The storage zone is inactive, that is the gases are drawn off below it as in the Mount type (American) kiln. Although the lime drawn was crumbly, and the shaft only 56 sq. ft. in area and the active portion only 40 ft. in height, still 40 tons of lime were produced daily. Output per square foot of shaft area was 1420 lb., but per cubic foot of active kiln content 35.5 lb. per day. The heat was quite rapidly taken out of the gas. In spite of the high capacity of the kiln the gases at the outlet were cooler than on our, low standard, the Tennessee kiln, which was of about the same size, but produced only one-fifth the amount of lime. This kiln reveals several interesting features; one, it has a straight shaft with no expanded active storage zone, so in a way it proves the contention made in the first part of this article that a large storage zone is of no value but for rock storage, and that rather likely due to indefinite gas and rock flow in it, a large storage zone may even be harmful from the capacity and heat efficiency standpoints. Then, while the gas passed through this kiln very rapidly and was in contact with the stone only 6.7 sec., it still had time enough to give up its heat; so evidently if the size of the stone is not too large, 40 ft. of straight shaft, provided it is always full and active, will do the necessary preheating and burning of lime. After that it becomes immaterial if the storage is on top of the kiln with gas going through it, or is located below the kiln. This kiln without strong induced draft would, of course, not have performed so well, but with the ample draft available the fact that the stone or lime was crumbly became almost an asset.

Kiln IX

The comparison between this Pennsylvania kiln and the previous English one is extremely interesting, but all to the disadvantage of the one in Pennsylvania. While the English kiln burned high calcium limestone, this one burned dolomite, which should make a great deal of difference in the efficiency, and all in favor of the Pennsylvania kiln. The shaft of this kiln was exceedingly large, 7 ft. by 16 ft. It is entirely too unwieldy and there is no reason for it. The output of this kiln per square foot was only 875 lb., and per cubic foot 10.4 lb., while the English kiln had an ouput of 1420 lb. per square foot and 35.5 lb. per cubic foot. The active height of the English kiln was 40 ft., and of this one 59 ft.; the gas to percolate up through the Pennsylvania kiln required 24 sec., while it passed up through the English kiln in only 6.7 sec. Yet the fuel-lime ratio of the Pennsylvania kiln, in spite of dolomite being burned, was no better—even somewhat worse. What could better demonstrate inactivity of heating surface and im-

proper flow of gas than this? But this Pennsylvania kiln did not have induced draft, and if it did have it, it is doubtful whether full advantage could be taken of it due to the large unwieldy shaft. However, better results could well have been expected from this kiln.

Kiln X

This Illinois kiln is one of the smallest gas-fired kilns encountered by the writer. In spite of the fact that it is operated without induced draft the capacity per cubic foot is high, 27 lb., or over two-and-a-half times that of the Pennsylvania kiln. In a way this appears good and is good, but the kiln is too low, the shaft area too small and the fuel efficiency impaired. If the Pennsylvania kiln is too large this kiln is as much too small, but forcing without mechanical draft is more easily possible with small than large kilns.

Kiln XI

This St. Genevieve, Mo., kiln is, in some respects, the best of all. The output is high, 60 tons, which should satisfy almost anyone: still this amount of lime is obtained from a shaft that is not too large. Lime in a 6x12-ft. shaft can easily be handled properly if the shaft is arranged to facilitate proper trimming. The output per square foot of shaft area is 1715 lb., higher than any other gas-fired kiln known to the writer, twice as high as the Pennsylvania kiln, higher even than the English kiln; and this output is obtained with a comparatively mild induced draft, requiring only 1.8 in., while the English kiln uses 6 in.; however, the lime is more firm, less likely to crumble and choke the passages. The output per cubic foot is 25.6 lb. almost three-and-one-half times as much as the Tennessee kiln. The efficiency is very good, even though the gas passes through the kiln in 9.4 sec. while in the Tennessee kiln, with lower efficiency, the time required is 31 sec. This again illustrates the importance of proper gas flow, of proper proportioning of kiln dimensions so as to assure proper gas distribution over all of the surface.

If there is anything wrong with the large Missouri kiln it may be the fact that possibly it is too high. It has a large storage superimposed on the shaft, and it is rather possible that the efficiency would be no worse if the gases were withdrawn below the storage zone as in the English gas-fired kiln. In many respects, however, this kiln is a happy compromise. It is not too large, as is the Pennsylvania kiln, and it is not too small as is the Illinois kiln. It is not like the Tennessee kiln, since it utilizes the shaft to a good advantage. It does not require too high a draft, as does the English kiln, and by virtue of various arrangements it can be controlled better. The German kiln is in no way superior. It has a good deep cooler, of which advantage is taken, and in almost all respects it makes the best use of the dollar invested.

Kiln XII

This is an old kiln coverted to gas firing and induced draft. In so doing, the capacity was increased from 18½ to 30 tons. Since, however, the stone burned is rather large and the kiln not very high, there is insufficient heat absorbing surface to operate this kiln at as high capacity as that previously mentioned. The induced draft on the kiln top, instead of 1.8 in. is only 0.5 in.; but 30 tons is a nice output from a kiln which for fifteen years was putting out 18½ tons per day—this especially since no large expenditures were necessary for its conversion.

Kiln XIII

This kiln, fired with gas from so-called, hand-poked, semi-gas producers, performs extremely well if the fact that it is natural-draft operated is taken into consideration. However, the gas and air enter under slight pressure—a mild, forced draft so to speak—which helps a great deal. For an old kiln built many years ago with little information of what was right or wrong in kiln design, this one certainly stands out and in many respects it is a path breaker. From it the writer obtained the first inklings of what governs capacity of lime kilns.

As we look back over the gas kilns tabulated and just described, we note the same extreme variations as we did with the mixed-feed kilns; but in spite of this, there are the same explanatory reasons pervading the whole—it all simmers down to amount of heat, amount of surface and the laws governing the flow of gases and transfer of heat.

Direct-Fired Kilns

The first of these, Kiln XIV, has already been described. It is our infamous Tennessee kiln, but what we can prove is that even a direct-fired kiln, inexcusable as they are from other standpoints, still can perform better than this.

Kiln XV

This West Virginia kiln demonstrates that induced draft helps direct-fired kilns also. The output of these kilns was only 11 tons until they were equipped with closed tops and a suction fan. If the draft was made stronger, more lime would be obtained, but the kilns are too low to be forced at any higher rate. However, fuel ratios operating at 15½ tons per day without any increase in kiln size are now no worse than before, when operating at low rates; in fact, it is somewhat higher. This same thing was observed with no other kilns, which goes to prove that gases flowing easily through the kiln, propelled merely by natural draft, that is, by slight differences of density, do not distribute rightly. Cool zones actually fight against the hot gas access, while hot zones in the kiln unduly attract it. This is a most unscientific way to express this, but still it describes about what happens.

Kiln XVI

This kiln is one of the ordinary, direct-fired, natural-draft kilns, of which type there are many in use all over the country. It is somewhat better than the Tennessee kiln, and under an exceptional superintendent it could be even better than the record shows, but under the best conditions it still would not be of much account. It is a plain case of failure to outgrow childhood in kiln design.

It will be noted that no German or English direct-fired kilns are tabulated for the simple reason that they cannot afford to operate them abroad and compete in business. For the same reason American direct-fired kilns will have to disappear eventually; they give poor lime, with high labor cost and low fuel efficiency. Enough now is known about the proper construction of lime-burning equipment that no fear need exist that investments in better kilns will not be more than fully justified.

Kiln XVII

This oil-fired kiln indicates that, other conditions being equal, with oil one should obtain a higher capacity than with ordinary direct-firing with solid fuels, since 18 tons with a 33½-sq. ft. shaft and natural draft is good. In running down the column several things are noted—the shaft height is less than in any of the other kilns and less than half that of some kilns. The storage zone is high, but the amount of gas is insufficient to properly fill it out. On this account at one draw, properly and at another improperly, preheated limestone will enter the narrow portion of the shaft; and then naturally the performance here is bound to become erratic. The output of 12 lb. per cubic foot of kiln space, as compared to 16.8 lb. for the West Virginia kiln, proves there is ineffective working of the storage space. The small, Illinois, gas-fired kiln converts charged rock into lime in 2.16 days, while here 4½ days are required. Evidently something is off; the shaft is too short, the storage zone too long, and the kiln is large enough to fully justify the application of mechanical draft, which should increase the capacity to 30 tons without impairing the efficiency, or rather likely, bettering it considerably.

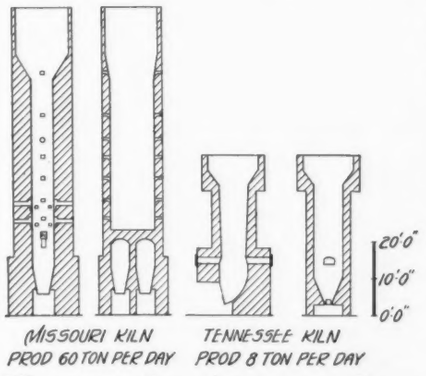
Closure

It now should be evident that there are quite a number of items to consider when judging a kiln, but when they are all known, by comparing with performance of other kilns a rather close valuation can be made. This was demonstrated in the case of the oil-fired Texas kiln; while an output of 18 tons looked upon in one way is not bad compared with the other kilns in the tabulation, the output really should have been 30 tons. The owners of the Tennessee kiln can, in no other way, better judge their equipment than by glancing across the seventeen columns with capacities from their's at the lowest to 112 tons at the highest, with simultaneously given kiln sizes and operating conditions.

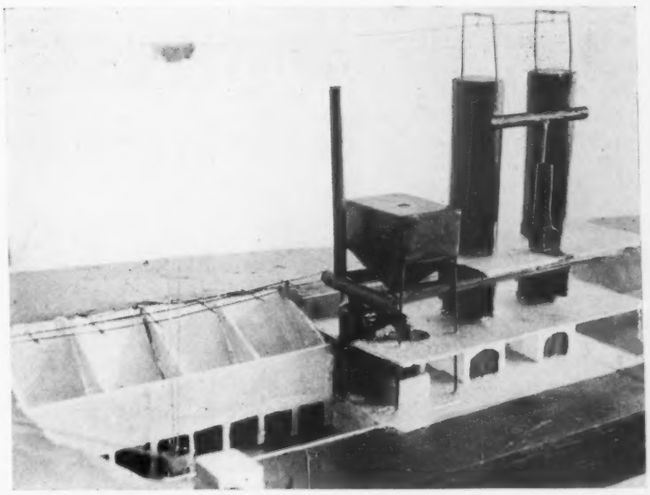
In the preceding pages frequent reference

was made to the low standard the Tennessee kiln with an output of only 8 tons of lime per day. Reference was also made to the 60-ton Peerless White Lime Co. kiln, the so-called Missouri kiln, which is being used as the high standard of performance. It would be interesting to visually compare these kilns and this can be done by referring to the enclosed illustration.

While one is twice as high and somewhat larger in horizontal dimensions, the output is 7½ times greater. While the large kiln has a fuel ratio in excess of 4½ to 1 the small kiln has



Kiln cross-sections of extreme producers



Model of an efficient gas-fired lime plant of modest capacity

DIMENSIONS AND PERFORMANCE FACTORS OF VARIOUS LIME KILNS

		MIXED FEED KILNS						GAS FIRED KILNS							DIRECT FIRED KILNS				OIL FIRED
1	METHOD OF FIRING																		
2	NUMBER	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	
3	PLANT DESIGNATION	RÜDERSDORF GERMANY	HERM BELGIUM	FULLER ENGLAND	HONE GERMANY	R&W KW GERMANY	WIESL GERMANY	HANST. GERMANY	RAI. HILL ENGLAND	CED. H. PENNSYLVA.	MARB. ILLINOIS	PEERLESS MISSOURI	PEERLESS MISSOURI	GLEN PARK MISSOURI	TENNESSEE	IVAN W. VA.	MINC. MISSOURI	N. BRAU. TEXAS	
4	KIND OF LIME	MIL. DLY HYDRAULIC	HIGH CALCIUM	MED HIGH CALCIUM	HIGH CALCIUM	SINTERING DOLOMITE	HYDRAULIC	HIGH CALCIUM	HIGH CALCIUM	MAGNESIUM	HIGH CALCIUM	HIGH CALCIUM	HIGH CALCIUM	HIGH CALCIUM	HIGH CALCIUM	HIGH CALCIUM	HIGH CALCIUM	HIGH CALCIUM	
5	SIZE OF STONE	VERY SMALL	NORMAL	NORMAL	SMALL	RATHER SMALL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	
6	FUEL AND HEAT VALUE	COKE BREEZE 9 1000 BTU	ANTHRACITE	BITUM. COAL 13,000 BTU.	COKE	COKE	COKE	COKE & COAL	BITUM COAL 13,000 BTU.	BITUM COAL 13,000 BTU	III. BITU. COAL 11,500 BTU.	III. BITU. COAL 12,000 BTU	III. BITU. COAL 12,000 BTU.	III. BITU. COAL 12,000 BTU.	BITUMINOUS COAL	W.VA. SEMI BIT. 13500 BTU.	III. BITU. COAL 11,000 BTU.	FUEL OIL	
7	OUTPUT TONS OF LIME PER DAY	80	112	56	85	85	56	50	40	48	13½	60	30	22½	8	15½	11	18	
8	KIND OF DRAFT	HIGH INTENSITY FORCE DRAFT	CHIMNEY DOUBTFUL DOUBT.	NATURAL DRAFT		FORCE DRAFT HIGH INTENST.	FORCED DRAFT	INDUCED DRAFT	VERY STRONG INDUCE DRAFT	NATURAL DRAFT	NATURAL DRAFT	INDUCE DRAFT 1.8" WATER	INDUCE DRAFT 0.6" WATER	FORCE DRAFT MILD	NATURAL DRAFT	INDUCE DRAFT 0.5" WATER	NATURAL DRAFT	NATURAL DRAFT	
9	SHAFT DIMS. AT BURNING ZONE AREA IN SQ. FT.	9'-0" DIA. 63½ SQ FT	26'-0" DIA 540 SQ. FT.	10'-0"×50'-0" 480 SQ FT.	14'-8" DIA. 170 SQ FT	8'-6 DIA 57 SQ FT.	7'-10" DIA. 49 SQ FT.	5'-6"×11'-6" 60 SQ FT.	8'-6" DIA. 56½ SQ FT	7'-0"×16'-0" 105 SQ FT.	4'-6"×6'-10" 30 SQ FT.	6'-0"×12'-0" 70 SQ. FT.	5'-0"×10'-0" 50 SQ FT.	5'-0"×7'-4" 36.7 SQ FT.	6'-6"×7'-6" 45 SQ FT.	5'-0"×8'-0" 40 SQ FT.	5'-0"×7'-6" 37½ SQ FT.	5'-0"×7'-6" 37½ SQ FT.	
10	COOLER DEPTH BELOW FIRING LEV. FT.	STRAIGHT SHAFTS ZONES INDEFINABLE						20	14	16	9	17.5	9	10.7	10	6	9	10	
11	SHAFT HEIGHT ABOVE FIRING LEV. FT.							28	40	37	20	42.5	26.3	21	20	22	21	17.3	
12	STORAGE ZONE HEIGHT FT.							16	NOT ACTIVE	22	10	18	16.5	19	9	5	13	25.5	
13	TOTAL KILN HEIGHT FT.	43.5	53	40	57.5	46	26	64	54	75	39	78	51.8	50.7	39	43	43	52.8	
14	COOLER SPACE CU. FT.	STRAIGHT SHAFTS ZONES INDEFINABLE						1200	850	2000	165	1070	306	340	400	150	240	250	
15	SHAFT SPACE CU. FT.							1700	2260	5150	665	2970	1320	900	1300	1025	790	647	
16	STORAGE ZONE SPACE AVERAGE EFFECTIVE CU. FT.							2300	NOT ACTIVE	3950	335	1710	1723	1500	840	570	1240	2100	
17	AVER EFFECT. KILN WORKING SPACE SHAFT & STORAGE ZONE CU. FT.							3850	2260	8800	1000	4680	2950	2250	2140	1595	2030	2747	
18	TOT. KILN SPACE EFFECTIVE & INEFFECTIVE INCLUDING COOLER CU. FT.	2800	28300	19200	9700	2500	1275	5200	3110 WITHOUT STOR.	11100	1435	6470	3349	2740	2540	1845	2490	3000	
19	OUTPUT LIME PER DAY PER SQ. FT. OF SHAFT AREA LBS.	2520	415	234	1000	2980	2290	1665	1420	875	900	1715	1200	1260	335	775	587	960	
20	LIME PER DAY PER SQ FT OF AVER KILN CROSSECT. BURN. & STOR. LBS.	STRAIGHT SHAFTS ZONES INDEFINABLE						1100	1420	585	648	1430	830	750	196	585	308	580	
21	LIME PER DAY PER CU FT OF EFFECT. BURN. & STOR. ZONE SPACE LBS.							26	35.5	10.4	27	25.6	20.3	20	7.5	19.4	10.8	13.1	
22	LIME PER CU FT OF TOT. KILN SPACE EFFECTIVE & INEFFECTIVE LBS.	57.2	7.9	5.84	17.5	68	87.7	19.2		8.3	18.8	18.5	17.9	16.4	6.95	16.8	8.8	12.0	
23	LIME EQUIV OF LIME & LIME STONE T. IN KILN INCLUD. COOLER WHEN FULL	762	680	460	231	60	38	156	93.5	331	43	193	101	82	69	55	74.5	90	
24	LIME EQUIV OF LIME & LIMESTONE IN BURN. & STOR ZONES. T.	20% OF SPACE INEFFECT. OR OCCUPIED BY FUEL						109	676	273	30	152	88.1	68.4	64.2	46.0	61	82.4	
25	TIME OF TRAVEL OF AVER LUMP OF LIME THRU KILN INTO COOLER DAYS							2.18	1.69	1.59	2.16	2.52	2.93	3.03	8.1	3.0	5.5	4.5	
26	TIME OF TRAVEL OF LUMP OF LIME FROM EXTREME TOP TO DISCHG. DAYS	0.95	6.1	8.2	2.7	0.8	0.7	3.1	2.34	7.2	3.24	3.24	3.35	3.6	8.63	3.6	6.7	5.0	
27	HEATING SURFACE IN BURNING & STORAGE ZONES SQ. FT.	41000	138500	94000	78000	24500	6250	25600	16000	61600	7000	32800	20600	15740	15000	11200	14200	19228	
28	AMOUNT OF HEAT ABSORBED PER HR. BY ALL SURFACES MILLIONS BTU.	12.2	20.0	10.0	15.1	14.2		8.9	7.1	7.7	2.4	10.7	5.3	4.0	1.42	2.76	1.96	3.2	
29	HEAT ABSORBED PER HP PER SQ. FT. HEATING SURFACE	295	144	106	193	580		347	442	125	345	280	256	254	95	246	138	150	
30	SHAFT FREE GAS PATH IN SQ. FT. SQ. FT.	15.9	135	120	44.5	18.3		15	14.1	23.6	7.5	17.5	12.4	8.2	11.2	10.0	9.3	9.3	
31	STORAGE ZONE FREE GAS PATH IN SQ FT. SQ. FT.	15.9	135	120	37.5	12.5		36	14.1	55	17.8	46.2	30.7	19.7	38.4	17.9	41.2	29.2	
32	VOL. OF GAS PASSING IN BURNING ZONE PER SEC @ 1650°F	234	380	190	272	288		170	136	156	46	204	102	76.5	27	52.5	37.4	61	
33	VOL. OF GAS PASSING IN STORAGE ZONE PER SEC @ 1050°F.	148	240	120	172	158		108	86	86	29	129	64	48	17	33.6	23.8	39	
34	VELOCITY FT PER SEC @ 1650°F. IN SHAFT	14.7	2.8	1.58	6.1	20.2		11.3	9.6	6.5	6.1	11.6	8.1	9.2	2.4	5.2	4.0	6.5	
35	VELOCITY FT. PER SEC @ 1050°F. IN STORAGE ZONE	9.3	1.78	1.00	4.6	12.6		7.9	6.0	1.6	1.6	2.8	2.10	2.44	0.45	1.88	0.58	1.33	
36	TIME IN SEC. FOR GAS TO PASS THRU KILN IF UNIFORMLY DISTRIB@1450°F.	3.4	21	29	10.5	3.8		9.2	6.7	24.3	8.5	9.4	11.8	19.7	31.0	12.4	21.0	17.5	

Tabulation of comparative kiln performance and influencing factors

less than 3 to 1. While the small kiln can be cheaply built, the large one with a gas producer will cost no more per ton of lime output. The labor cost with the large kiln is less than half the labor cost with the small kiln on the basis of output. The lime is better burned, containing less core, less overburned material, less discolored material, and lime contaminated to a smaller extent with SO_2, arsenic, etc. With one type of plant the concern can successfully compete in a low price lime market and make money, while with the other such competition is extremely difficult or impossible.

This comparison is of the two extremes, other plants are of all intermediate shades, and the above contrasts in performance may and may not apply.

Patent Granted for Burning Ground Dolomite in a Rotary Kiln

A Process Claimed to Insure a Finishing Lime Hydrate

A PATENT granted Victor M. Frey, York, Penn., October 30, 1928 (No. 1,689,237), describes the following process of manufacture of a dolomite lime for finishing hydrate:

"According to my invention, the dolomite is first ground advantageously so that all of it will pass a 50-mesh screen and much of it will pass a 100-mesh screen. Coarse grinding may be used, but corresponding longer heat treatment will in such case be required. Uniform grinding, however, is desirable, as it tends to equalize the heat conditions within the different particles during the heat treatment.

"The ground dolomite is then passed through a rotary kiln under such conditions of temperature and time of exposure that the material is thoroughly decarbonated without any sintering or hardening of the particles. For this purpose the size and pitch and speed of rotation of the kiln, and the temperature maintained therein and the fineness of the grinding, should be suitably and correlatively adjusted until the desired light colored soft unsintered decarbonated product is obtained. Since the reaction brought about in the stone depends not alone upon the kiln temperature, but upon the exposure to the reactive temperature of each molecule of the stone for a sufficient time for the reaction desired to occur, various adjustments are possible which will produce the desired result with sufficient accuracy for practical purposes. The general requirements are that the maximum temperature obtained by the mass of material or any substantial portion thereof shall be relatively low as compared with those used in burning dolomite for other purposes, so that the formation of compounds or eutectics of lime and magnesia with impurities such as silica iron and alumina and the conversion of the magnesia into hard periclase crystals may be minimized. On the other hand, the heating conditions much be such as substantially to decarbonate the stone and destroy its original crystalline structure without heating beyond the point where the plastic qualities become impaired.

"As an example of suitable conditions I have found that with dolomite ground to the fineness above suggested, treatment in a rotary kiln of the usual type, 120 ft. long by 6 ft. in diameter, with a pitch and speed of rotation adjusted to pass the material through the kiln in about 6 to 7 hours with a temperature in the hot zone of about 1600 deg. F., will yield a very satisfactory finishing lime.

"The material after coming from the kiln is of course hydrated or slaked in the usual manner for the preparation of finishing lime. Tests of the product have shown it to be a very high grade finishing lime and to have a plasticity figure well above the standard of 200, usually between 220 and 270.

"I have further found that the color of burned dolomite depends not only on the impurities present but also on the temperature at which it has been burned. By regulating the heating conditions, as above suggested, a pure white finishing lime may be obtained even though a small percentage of decolorizing impurities such as iron oxide are present in the raw dolomite. For making a white product it is, of course, desirable to select a raw material that is as free as practicable from impurities which tend to color the finished product. But when using my process it is not necessary to be so careful in selecting dolomite free from iron oxide and other impurities tending to color the product as has heretofore been deemed essential for making finishing lime from dolomite by other processes.

"It will be obvious from the foregoing that various modifications may be made in the details of the process above described without departing from the spirit and scope of my invention.

"I claim:

"1. In a process for the manufacture of finishing lime, grinding dolomite rock, passing the ground dolomite without admixture of plasticity producing material through a rotary kiln, maintained under heating conditions insufficient to sinter or harden the particles, but adequate substantially to decarbonate the mass and hydrating the product thus obtained.

"2. In a process for the manufacture of finishing lime passing finely ground dolomite without admixture of plasticity producing material through a rotary kiln of such size, pitch and speed of rotation as to keep the material in the kiln about 6 or 7 hours while maintaining a temperature in the hot zone of the kiln insufficient to sinter or harden the product, but sufficient substantially to decarbonate the mass and hydrating the product thus obtained.

"3. In a process for the manufacture of finishing lime passing finely ground dolomite without admixture of plasticity producing material through a rotary kiln while maintaining a temperature around 1600 deg. F. in the hot zone of the kiln, at a rate sufficient substantially to decarbonate the material without sintering or hardening thereof and hydrating the product thus obtained.

"4. In a process for the manufacture of finishing lime passing finely ground dolomite without admixture of plasticity producing material through a rotary kiln of such size, pitch and speed of rotation as to keep the material for 6 to 7 hours in the kiln while maintaining a temperature around 1600 deg. F. in the hot zone of the kiln and hydrating the product thus obtained.

"5. A process for manufacturing finishing lime which consists in grinding impure dolomite, in decarbonating the ground dolomite without admixture of other solid substances, while agitating the same at a temperature below that necessary to produce sintered or hardened particles, and in hydrating the product thus obtained.

"6. A process for manufacturing finishing lime which consists in grinding dolomite containing more than 2% of natural impurities, in decarbonating the ground dolomite without admixture of other solid substances, while agitating the same at a temperature below that necessary to produce sintered or hardened particles, and in hydrating the product thus obtained.

"7. A process for manufacturing finishing lime which consists in grinding dolomite of the types occurring in New York and Pennsylvania, in decarbonating the ground dolomite without admixture of other solid substances, while agitating the same at a temperature below that necessary to produce sintered or hardened particles, and in hydrating the product thus obtained."

The "Eighteenth Amendment" of the Portland Cement Industry

A Discussion of the Relative Merits of the Dry and Wet Systems of Portland Cement Manufacture

By H. H. Blaise*

IT IS PROBABLE that the layman does not suspect that the portland cement industry has a wet and dry issue within its own ranks; that, within this narrowed sphere, has at times assumed the intensity of our modern discussions on temperance. However, the cement industry has not yet ventured upon the question of alcoholic content, although the growing induction of chemical problems into the game may eventually introduce this phase in one way or another; but to date has confined itself to the question of whether, "there shall or shall not be water!" It is probable that we shall witness a shifting advantage for many years in the arguments for and against wet process cement manufacture as compared with the dry system.

In brief, the dry advocates claim certain advantages of cheaper construction and cheaper operating costs which the wet process supporters vigorously deny; while in turn the wet process men proclaim finer and more uniform quality, a statement just as vigorously opposed by the dry process boosters. That there must be an essence of truth in evidence presented by both sides is borne out by the fact that there are many successful plants which have been operating for many years on both processes.

Wet-Process Advanced Through Rotary Kilns

We no longer refer to the wet process in the original sense of the phrase, for the use of marls and materials recovered in the wet condition are in the minority. Rather does the term refer to that process once called "semi-wet," in which the moisture in the raw materials ranges from 30% to 42%. Under this system water is added to make the process wet, whereas in the old system the marls contained upwards of 50% water and wet-process manufacture was obligatory and not optional as is now the case. Convenience and economy then suggested and still does, that the water be removed in the kilns. In truth, the first cement manufacture of any importance was of a wet type. This, to the extent that water was added to the raw mix to cause cohesion of the mass for placement in the old upright kilns. Examples of these old kilns may be seen frequently in the Lehigh Valley of the United States, while more modern developments of such units are efficiently operating in Europe today.

However this method was not the wet process in any possible modern adaptation of the word, and the arrival of the rotary kiln was not long in swinging the pendulum to the other extreme. For a period of ten or fifteen years after this, by far the majority of mills constructed were of the dry type. To these plants were such exceptions as those built to operate upon marl, which of necessity required wet operation. During this period the feeling persisted that the ultimate of cement manufacture would be reached through the dry process and it is just possible that larger outputs, mild competition and favorable fuel comparisons lulled the dry ranks into a feeling of false security. Perhaps the basis for this thought was intrinsically sound, for even the tyro may perceive the apparent inconsistency of the addition of water to a mixture when it was to be removed later at the cost of a great many good round dollars. It seemed obvious that there could be no argument for such a maneuver unless it could be proven that there were positive advantages to be gained in excess of the cost of subtracting and adding the water.

However there is seldom any progress that is not preceded by an upheaval, and this upheaval came in the form of higher quality, resulting in some upward revision of specifications. This was in the main, due to the fact that about 1919 numerous wet mills of more modern design began to spring up all over the country. These plants, designed with large size units of very simple construction, giving especial attention to blending and mixing of the raw materials, found it an easy matter to produce cements with high early strengths. In addition to this feature of uniformity and strength, these mills were clean and sightly affairs, and in many cases a distinct credit to their communities. This cleanliness enabled the builders to place their plants close to the more heavily populated centers of distribution where the demand was greater and the charge for freight was less. Several mills of this type secured permission to build and are now operating within the corporate limits of some of our larger cities. To combat this advance accomplished in the wet process the dry mills have in many instances improved their mixing facilities and increased kiln lengths in an effort to maintain a parity between the systems, and at the same time keep the advantage of lower cost construction and manufacture.

Comparison of Claims for Two Processes

We make here an examination of these claims to ascertain the actual truth in the following instances, that is the matters of *first*, construction costs; *second*, operating costs; *third*, quality.

The matter of cleanliness is disposed of with the simple statement that dirt has no place in the modern mill. With modern systems of dust collection, transport and ordinary precautions there is no excuse for dirty plants provided there is the will to eliminate the dust makers. We then apply ourselves first to the matter of construction costs.

In the quarries, clay and shale fields there is no difference in favor of either the wet or the dry process. Equipment that applies to one is just as practical in the other, although the wet process has the option of occasionally using pumps for transporting the argillaceous materials instead of the more common methods. This is merely a matter of cost position, though seldom based on necessity. The same situation exists in the crushing departments where the wet system may employ the use of wash mills for putting clays into "physical" solution if found advisable. In the main there is nothing in the construction of either the dry or wet process that may be of advantage up to this point.

Milling Practice Compared

Here, the dry mill must go to the additional expense of building dryers for all the material used, as well as bins and other accessories. This extra maneuver is necessitated by the fact that cement-mill, grinding machinery has certain definite limitations as to its adaptability to the moisture contents of materials supplied. These machines, almost without exception, must either receive material that is very wet or very dry. There is no middle range of operation, and speaking in generalities, it will be safe to say that raw materials must contain less

*Died April 23, 1929.

than 4% water or more than 30% water. Inasmuch as most clays, shales and other argillaceous materials possess an inherent moisture of 8% to 16% drying is made obligatory. We accept then an extra charge of say $75,000 to $150,000, depending upon the size of the mill, for drying machinery in the dry mills.

In the next department there is a great similarity in the machinery used, in both dry and wet mills, in reducing the raw materials to a size of which approximately 80% to 92% passes a 200-mesh screen. Roll mills, ring and die mills and similar machines are at once eliminated from the possibilities of the wet system as unsatisfactory. Tube mills, ball mills and their derivatives are accepted as fairly standard units for reduction of crushed raw material in both methods and the cost in either case is the same.

Mixing and Blending Raw Materials

Until recently the matter of mixing the raw materials in dry-process plants received very little attention. Wet-process plants have standardized upon the practice of positive lime control, as is easily accomplished by mixing after grinding in proper proportions in large slurry tanks. These tanks for mixing, and the air and mechanical agitators employed for agitation of the ground slurries, have been pointed to in the past by the dry advocates as an unnecessary and extra construction cost not found in the dry mills. That the expenditure for mixing in wet mills has been productive of good results has been borne out by the fact that practically without exception late practice in dry plant construction has indicated the installation of devices for blending and mixing of raw meal. In almost every instance successful dry blending units have equalled in cost those installations of like nature used for mixing in wet-process mills.

Burning Practice

In kiln departments the tendency in recent years has been to install longer and longer units. Years ago the arrival of the 100-ft. kiln brought the prophecy that the extreme limit of length had been reached. Today, with 350-ft. kilns operating, they still prophesy that longer kilns will not be built. It would appear that this increased length has had less influence upon the matter of production than the diameter. The extra length above 240 ft. has probably served as a dryer for slurries, and in some cases the lower or delivery ends of the kilns have been employed as coolers to conserve heat. The longest units have as a rule been wet installations. Where, in the dry process, units have been slightly shorter and the heat has been applied to waste-heat boiler installations, in the wet plants low temperature exit gases have been secured by slurry drying.

The waste-heat boiler installations have an initial cost by far out-balancing any additional kiln length cost, and furthermore the advisability of these boiler installations disappears as kilns grow larger, due to the fact that serious power interrupiton results, from a shut-down of a single one of these large kilns. The rule has been to eliminate waste-heat boiler installations where large kilns are installed. Since long kilns have proved their efficiency when correctly operated and waste-heat boilers are very costly to install, the consensus of opinion would probably favor the long kiln if a choice were to be made. This is true regardless of the process of manufacture. Particularly is this fact accentuated since it has become increasingly profitable to purchase the power required instead of manufacturing the power used. The power business is specialized and most cement plants can ill afford to enter into competition with dump power rates. There are exceptions to this, of course, but it is also true that when these waste-heat boilers are placed on dry kilns, then the construction cost is very much increased. However, nearly any cement plant superintendent who has operated a power plant in conjunction with his mill knows that it is a decided worry and a creator of much expense.

Summary of Construction Costs

Up to this point, then, the construction costs appear to be about equal. If there is an advantage it rests with the wet-process plants by virtue of the extra expenditure called for by the drying department in the dry process. Our construction costs may then be roughly summarized as follows:

Clay, shale and quarry departments—No difference.

Crushing and storage departments—No difference.

Raw grinding departments—Dry process 10% higher, due to cost of dryer installation.

Kiln rooms:

(*a*) Without waste-heat boilers—Very little or no difference.

(b) With waste-heat boilers—Dry plant 50% higher.

Since the remainder of the process of manufacture is exactly the same there is no difference in construction or other costs. It would then appear that the amount required to build either type of mill would be so near the same total as to preclude serious consideration of the differential, provided there was no other factor that was of vital influence. It would obviously be good business to invest $100,000 extra at first if assurance was forthcoming that $10,000 per annum could be saved by the move.

Comparative Operating Costs

We may consider the operating costs. In the case of power consumption both systems will on identical operations require the same amount of power from the quarry to the drying department. Here the dry mill will take extra power to perhaps the extent of 0.2 cents per bbl. for the drying operation. Entering the raw-grinding department we arrive upon the scene of much controversy. There is a radical difference of opinion as to the ability of the wet mill to grind with less power. No less an authority than Richard K. Meade has come out definitely with the statement that the wet mill will not effect a power saving. A large number of tests by the writer have convinced him that just the opposite is true, and that there is a power saving when materials are reduced by the wet process. The reservation is made, however, that proper moisture adjustments be made and that the materials ground be limestone and clay. The experiments made upon other materials do not appear to be conclusive enough as yet for definite assertion. Neither are these figures based upon production of flour above 200-mesh.

Authoritative results brought forth recently have established the fact that fines within limits that have upper extremes as well as lower are distinctly advantageous in the kilns. It would seem then that a definite answer would require inspection from this angle as well. However on the basis of the past, we assign a grinding advantage of ½c. per bbl. to the wet-process. Moisture regulation in such tests is of supreme importance since upon certain materials grinding efficiency has been decreased 15% by varying the moisture content 2% from the point of maximum output. Some figures at hand which may be accepted as recent, give a saving of not less than ½ k.w.h. per bbl. of raw material ground by the wet process. Since the mills furnishing these data have a number of variables such as fineness, size of mills, mill speeds, size of balls and types of grinding media, it is exceedingly difficult to accept the figures as final. Some additional cost is entailed in the wet process due to the propensity for greater wear of grinding bodies and mill liners. The extra wear does not appear to over-balance the power saving.

Comparative Costs of Mixing and Blending

Estimates, purporting to show that the cost of mixing the raw materials in the wet-process plants are higher, are rarely based on conclusions of identical results. Until recently it was habitual in dry-process plants to deliver the mix directly from the grinding mills to the kiln-feed bins without any effort to correct the lime content of materials, which had passed through with variable composition. Such a system was satisfactory enough where the analyses of raw materials showed few sudden deviations from the proper chemical balance. However, during this period when such control was popular there were many mills that were constructed as dry units and later changed to wet at considerable expense in order to obtain better control of the raw materials. It is highly probable that these mills could

have obtained satisfactory dry mixing systems even at that date, but either the force of habit was so strong, or the reluctance to enter an, as yet, unproven field so overwhelming, that very little attention was given to this option at that time.

This is beside the question except to point out that at an early period positive control was a fixed ritual in the average wet-process plant, and that furthermore it proved to be an asset when difficult mixing conditions were met. If it proved to be an asset under extremely difficult conditions, the question naturally arises, why should it not be the thing to do under all conditions? The crux of the argument then is "how good is good enough."

We favor one man's opinion that under usual and normal conditions the allowable variation of a kiln feed should be within ½ of 1%, between the maximum and minimum percentage of lime carbonate in the mixture. If this be true or even approximately true then the number of dry-process plants in which blending operations of some magnitude are not required are in the infinite minority. Furthermore, where this specification is fulfilled and blending systems have been installed in dry plants, the cost of mixing in wet plants has been met dollar for dollar to accomplish the same results.

There is not the slightest wish here to convey the impression that the dry plants of modern type and under progressive management do not mix enough. It is desired to correct an erroneous impression that there is a cost differential. Given the same degree of attainment there is positively no dry-process advantage and considering the comparative ease with which solutions may be mixed as compared with dry powders it seems logical to assume that there never will be any.

Cost Differential in Favor of Dry Process

When we reach the kiln department we find a situation wherein there can be no argument as to the existence of a cost differential. It most certainly is to be admitted that it requires more heat to evaporate some 300 lb. of water and bring 600 lb. of raw material to 2600 deg. F., than it does to bring a barrel of material weighing 600 lb. to the same temperature, when the 300 lb. of water is removed from the equation. That in a word is the main cost difference in the two types of kiln rooms. In practice a kiln requiring, say 1,000,000 B.t.u. per bbl. of clinker produced would in the wet process call for some 200,000 B.t.u. more.

Aside from this question, we have never been able even remotely to approach the thermal efficiency of the old-time shaft kiln. The best of the modern kilns require nearly twice as much fuel as the upright kilns and their old record of 90% efficiency in this field will no doubt tax the efforts of users of the rotary type for some time to come.

Returning to present-day conditions, we must admit at least 4½c. differential per bbl. of clinker in favor of the dry process. This single item overshadows all other cost differentials. Even if we charge the coal used for drying against this item we still have a comfortable profit for the dry process. There is also the matter of kiln output. It is a fact that most kilns will produce somewhat more clinker when operating upon dry material. A 7- by 135-ft. dry kiln will deliver about 15% more clinker than the same sized unit using a wet feed. When the size is increased to say 11 ft. by 240 ft. this production differential decreases to a matter of 3%.

Plainly we cannot count on an important difference in overhead charges where the larger kilns are used in new plants. Eliminating charges fixed by dryer installations and some additional man-power in this department, we may believe that the dry process can operate at a cost which is about 2½c per bbl. less than that required by the wet process. While this seems to be a very small sum to be the subject of so much controversy, nevertheless in recent years many plants have been operating on such close margins as to stress even such small savings.

Probable Better Efficiency of Two-Stage Burning

Before we leave the subject of kiln operation we may digress shortly in a reference to the apparent output differential between wet and dry kilns. A few years ago a Japanese mill found it necessary for a time to use in the mix lime that had been burned or calcined in shaft kilns previously. It was noted then that the clinker production increased some 100% (the actual figures are not available), when this material was used. This would seem to indicate that our kilns are now being restrained in output by the necessity for regulation to the speed of carbon dioxide removal.

The first thought then would be that burning in a single stage, as we now practice it, is not the proper system and that the process is a two-stage problem. By this is meant that the carbon dioxide, and in the wet mills the moisture too, should be removed in the first step, a step that would suit the conditions required for this procedure, and that the actual clinkering should be accomplished at a much higher rate of speed. There is not the slightest doubt that much higher thermal efficiencies could be obtained on kilns operating at from 5 to 10 r.p.m. than at present. The waste gases from the clinkering zone could of course be utilized to do the major portion of the calcining of the limestone, since the stack gases of the usual dry kiln possess more than enough heat to do this, although there would be no serious objection to the appliance of additional heat. Where plants were operating on high grade limestone and clay mixtures the hydration of the calcined limestone after the first step of burning would produce an extremely fine raw meal, far beyond the possibilities in an economic sense of any of our present-day cement grinding machinery. This move would, if carried through successfully, eliminate at least 75% of the raw grinding cost, since the clays are generally very close to the proper fineness, with very little reduction. Double the clinker output might result with thermal efficiencies far closer to the theoretical limit of perfection. Here is at least 20c per bbl. awaiting the manufacturer who can put such a system into practical operation.

The Question of Quality

The third subject of controversy in the wet and dry issue is the question of quality. The importance of this point has been stressed more and more in recent years, and the cement chemist has more frequently been called upon to help fill the breach made by savage post-war competition. Special cements, some of which are of the patented variety, most of which claim the advantage of early strength developments, have been put upon the market. Most of these cements carry a very high lime content and certain methods of manufacture that require in advance that these products shall be marketed at an extra price. These cements are making some inroad in the concrete products market, road work and other jobs calling for early high strength. It does seem that there is a certain lack of logic behind such an invasion, when we pause to consider that fully 75% of the concrete placed at present is mixed in such a manner that a large portion of the strength and early hardening properties of the portland cement is not made available.

Very little opposition has been offered by the average portland cement manufacturer to this competition except through the medium of wet-process plants. Due to the thorough system of mixing in the wet process it is often possible to carry a slightly higher lime content without fear of unsoundness or undue waste of fuel. The majority of fuel wastes occur during adjustments, or lack of adjustments, to meet variations of the lime content of the raw materials. These variations also tend to lower the average strength of the final product. In a few words these new mills are producing what is generally accepted in the trade today as a "superior product."

This phrase "superior product" is certainly open to attack in as much as the new quality of high early strength which characterizes it is obtained by the introduction of a large amount of tricalcium silicate into the clinker, or those elements which form tricalcium silicates. It has not been established to our satisfaction that cements con-

taining this ingredient in excess are the cements of the greatest durability. Tricalcium silicate is the compound in cement that contains the largest amount of lime. If due to unstable methods of manufacture a portion of the lime is released, it is done in proportion to the amount of lime present. Free lime is the element or compound which is reputed to cause the most rapid disintegration of concrete. Hence there is room for considerable doubt as to the feasibility of terming the new products, a "superior product." This must be true especially where the market has been taught to believe that cement is truly a permanent building product. These cements are to some extent still in the experimental stage and we must retain our habit of making a product which will deliver many decades of staunch service. It will require a number of years to reveal the true worth of these cements.

However, if we must accept the high tricalcium silicate cements as the "superior product" without more ado, then we must admit that the wet-process plants as a whole are best fitted to produce it. At least we can concede that they have taken the initiative in the matter and have in some sections forged ahead of dry-process mills in this brand of quality. Whereas, fifteen years ago the pendulum was at the other end of its swing and dry-process manufacturers were chiding the wet-process men for using antiquated methods, we have recently witnessed just the contrary. The wet-process men have responded nobly, perhaps too nobly for the benefit of the costs of all concerned, and they are now producing cements that are requiring the best efforts of the drys to equal. That the drys are equalling this effort is proven by the fact that some dry-process mills have blending systems that accomplish all that can be asked within reason. In some of the eastern mills where competition is very keen some of the best cements are made in plants where all components are mixed by the dry method. It may be that we are about to witness the swing of the pendulum back again.

Granting that the wet materials are easier to mix, there are other studies that reveal possible future economies not now applicable to the wet system. For example the trend of certain recent published articles has pointed to the fact that there is a definite gradation of fines of raw materials best suited to strength, quality and kiln-room economy. Strangely enough the proper particle size of the fractions indicated in these examinations is not the ultimate size now obtained in either the wet or dry process, but exists in a field about midway between the coarser sizes and the so-called flour of most raw mixtures. These sizes are best obtainable by air separation. This at once excludes the wet process from participation from this economy since mechanical separation is the only resort of that method. [In wet process it can be obtained by hydraulic separation.—Editor.]

We therefore find the industry at a stage where construction costs of the two methods are about balanced. Operation costs of the dry mills are slightly lower, while the quality situation presents the spectacle of the wets a very few laps ahead of their dry brethren, who are speedily overtaking them. The whole industry faces a larger array of strange problems than ever before. Closed-circuit grinding, early strength cements, removal of moisture by filtration, two-stage burning, and new methods of material size reduction are but a few of the things that may alter the whole aspect of the controversy within the not distant future.

Production of Magnesite in 1928

THE PRODUCTION of crude magnesite in the United States in 1928 was 127,190 short tons, valued at $1,098,470, according to statistics compiled by the United States Bureau of Mines, Department of Commerce. Four operators working four mines, one each in San Benito, Santa Clara, Stanislaus and Tulare counties, in California, produced 41,300 tons of crude magnesite, valued at $454,300. All of the output in Washington was from the mines of the Northwest Magnesite Co., which produced caustic calcined and dead-burned magnesite at Chewelah. Two of its six furnaces were operated most of the year.

MAGNESITE SUPPLY IN THE UNITED STATES, 1922-1928, EXPRESSED AS CRUDE MAGNESITE, IN SHORT TONS

Year	Domestic	Imported	Total*
1922	55,790	217,861	273,651
1923	147,250	151,092	298,342
1924	120,100	148,700	268,800
1925	120,660	142,283	262,943
1926	133,500	196,318	329,818
1927	121,490	149,126	270,616
1928	127,190	157,492	284,682

*Prior to 1924 a factor of 2 tons of crude to 1 of calcined was used in expressing imports as crude magnesite. Since 1924 the factors used are 2 to 1 for imports from Italy and 2½ to 1 for other imports.

Sales of magnesite of domestic origin in 1928 were 620 tons crude, 9570 tons of caustic calcined (a decrease of 31% as compared with 1927) and 48,980 tons of dead-burned (an increase of 22% as compared with 1927), having a total value of $1,536,810.

Imports of magnesite in 1928, according to the Bureau of Foreign and Domestic Commerce, were 842 short tons crude, valued at $7593, of which 90% came from Greece; 5395 tons of caustic calcined, valued at $130,890, of which 62% came from India and 36% from the Netherlands; and 57,265 tons of dead-burned, valued at $836,386, of which 99% was from Austria and Czechoslovakia. Corresponding figures for 1927 are 891 tons of crude, valued at $9790; 9463 tons of caustic calcined, valued at $229,952; and 49,873 tons of dead-burned, valued at $727,881.

Prices

According to the *Engineering and Mining Journal*, quotations on crude magnesite during 1928 were $14 a ton from January to May 5, when the price was reduced to $11 a ton. California Grade A, caustic calcined, ground 80% through 200-mesh, was quoted at $40 to $43 a ton during the year and Grade B at $37.50 to $40 a ton. Dead-burned was quoted, f.o.b. California mines at $30 to $32 in January and February, $29 in March and April, $28 from May to September 8, when the price rose to $29 a ton for the remainder of the year. Quotations, f.o.b. eastern seaboard, were $40 a ton throughout the year.

Domestic producers reported sales of crude magnesite at from $7.50 to $11 a ton, f.o.b. shipping point of mine, and the average price for all magnesite sold crude was $9.18 a ton. Producers of caustic calcined magnesite in the United States reported sales at from $22 to $35 a ton, the average price for the total sales of domestic being $31.82 a ton f.o.b. shipping point. Domestic dead-burned magnesite was sold at from $22 to $44 a ton, the average price for the entire output being $25.04 a ton, f.o.b. shipping point.

Producers reported stocks of 2520 tons of crude magnesite at plants on December 31, 1928.

Canadian Ore Dressing and Metallurgy

DURING the year 1926 the Canadian Department of Mines Laboratories, consisting of an ore dressing plant for both metallic and nonmetallic minerals, pyrometallurgical, electrochemical, hydrometallurgical and chemical laboratories, were devoted to experimental and research work on ore treatment. Some of the experimental data obtained was published in previous governmental publications. In the book No. 638, "Investigations in Ore Dressing and Metallurgy," Mines Branch, Department of Mines, published at Ottawa, is included reports No. 241 to 262, inclusive. Each report thus included deals with the results obtained on separate lots of ores sent to the laboratories from Dominion sources. The type of ores received and examined, and on which reports were made in this book, included gold, silver, copper, zinc, arsenic, lead and bentonite clays.

DOMESTIC SUPPLY OF MAGNESITE IN VARIOUS FORMS IN 1928

Class	Sales (domestic) Short tons	Sales (domestic) Value (f.o.b. mine)	(General Imports) Imports* Short tons	(General Imports) Imports* Declared value	Total Short tons	Total Value
Crude	620	$ 5,690	842	$ 7,593	1,462	$ 13,283
Caustic	9,570	304,500	5,395	130,890	14,965	435,390
Dead-burned	48,980	1,226,620	57,265	836,386	106,245	2,063,006

*Subject to revision.

A Modern Chemical and Petrographic Laboratory for Research and Control Work

General Refractories Co.'s Laboratory at Baltimore, Md., Serves 15 Plants

By George M. Earnshaw

AT first thought, it may seem that a description of a refractories company's testing and research laboratory in ROCK PRODUCTS is misplaced. On second thought, however, in considering what a vital part refractories play in the production of cement and lime, it is to be realized that such a description will undoubtedly be of interest to many readers of ROCK PRODUCTS. Moreover, there is no great difference in a research laboratory for refractories and one for cement or lime.

Of the 150 or more refractory plants in this country, only a comparatively few operate their own laboratories. The General Refractories Co., whose home office is located at Philadelphia, Penn., came to the conclusion three years ago that in order economically and consistently to produce uniform products from its 15 plants, scattered among several states, and in order to meet the need for the development of new and improved products, it would be necessary to establish a modern and complete laboratory.

Serves 15 Plants

The company's operations include 15 plants located at Baltimore, Md., Beach Creek and Claysburg, Penn., Danville, Ill., Hitchens, Ky., Joliet, Ill. (two plants), Karthaus, Mill Hill and Mount Vernon, Penn., Olive Hill, Ky., and Orviston, Sandy Ridge, Sproul and West Decatur, Penn. In addition to these plants, the company operates its own clay and coal mines and ganister quarries. The location of the laboratory at the Baltimore plant was decided upon because of this plant's proximity to the home office and because more than two-thirds of the plants are located in the east; thus it was not intended to serve the Baltimore plant particularly. However, the Baltimore plant provides facilities for carrying on tests after they have passed the laboratory stage, which is not only necessary sometimes, but also of practical importance.

Testing Equipment

The laboratory as a whole is housed in a two-story and basement building of fireproof brick construction. The second floor is devoted to offices for the staff, a fuel-testing room, balance room and one large room used for chemical tests and research. This chemical laboratory is equipped with practically every kind of apparatus and appliance necessary to such a laboratory. A general work table, set in the center of the room, holds many of the major pieces of equipment such as two ignition furnaces equipped with temperature measuring and control devices, capable of producing a heat of 1800 deg. F.; manifolds, for fluxing the various materials preparatory to making analyses; an autoclave for impregnating brick specimens with water in the determination of porosity and specific gravity (the determination of porosity is important in determining the resistence of the various refractory materials to slag attack and the determination of specific gravity is a guide to the thoroughness of the burn); a large hot plate for general utility work, such as for boiling, and two thermostatically-controlled electric drying ovens for moisture determinations and for drying the various materials preparatory to making analyses. The table is provided with a hood for carrying off all fumes and heat. In addition to the work table, there is a specially enclosed fume cabinet which is used when making analyses involving the use of hydrogen-sulphide and other obnoxious gases. There are also the usual laboratory appliances, cabinets, work benches and a special stock room for chemical re-agents.

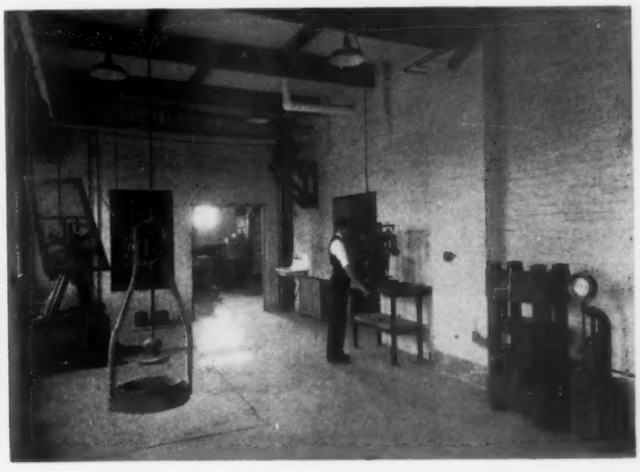
In general, the chemical department of the laboratory is provided with all the equipment and supplies necessary for the exact determination of the chemical constitution and re-action of the various refractory materials, both in the raw and finished state.

Small Experimental Plant

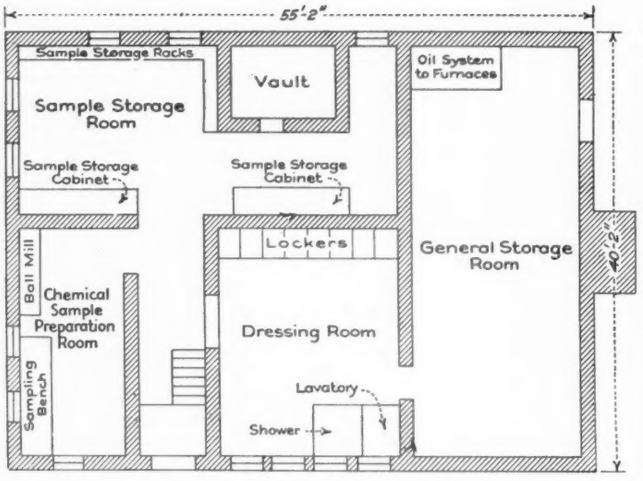
The first floor contains a complete small scale plant for manufacture of experimental brick, a physical testing department of the laboratory and the petrographic, or microscopic, department. The latter is said to be one of the best equipped laboratories of its kind in existence and consists of a microscope with photographing equipment; lathes for grinding samples of materials to a transparent thinness for microscopic study, and a research-type furnace, electrically heated and controlled, and capable of producing temperatures up to 3300 deg. F.

The function of the physical department is to study the results of the various combinations of refractory materials as repre-

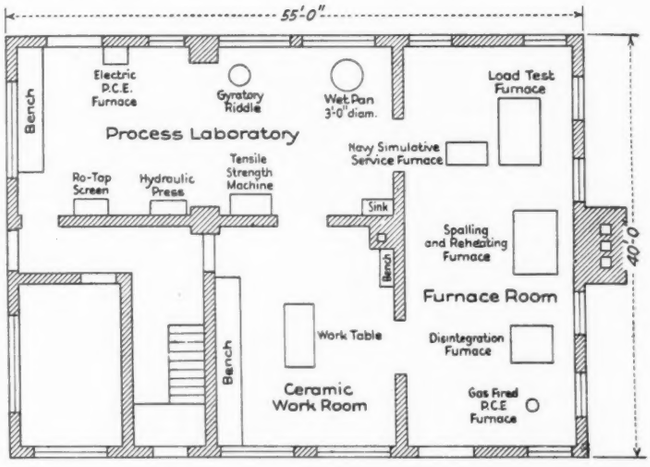
The modern laboratory building of the General Refractories Co. at Baltimore, Md.



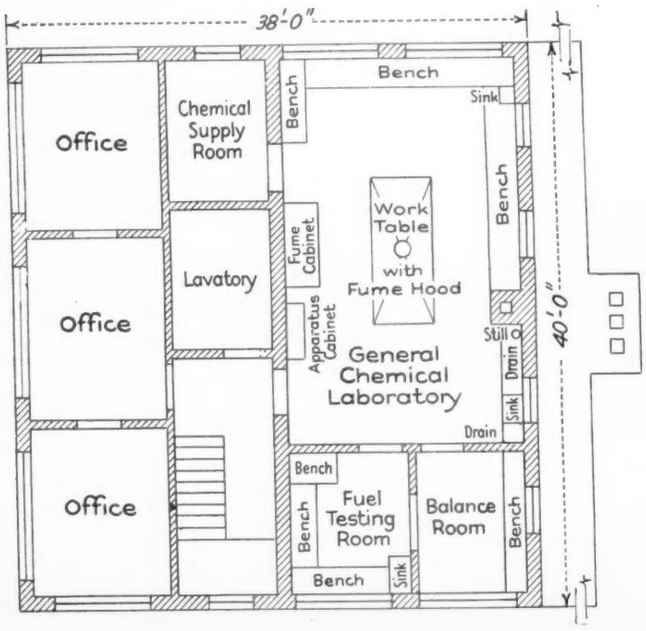
The general process laboratory on the first floor, with the furnace room beyond the far door



Ground plan of the basement in which are located the vault, sample storage rooms and locker room



The main floor contains the physical testing laboratory and a small scale brick plant, together with general furnace room

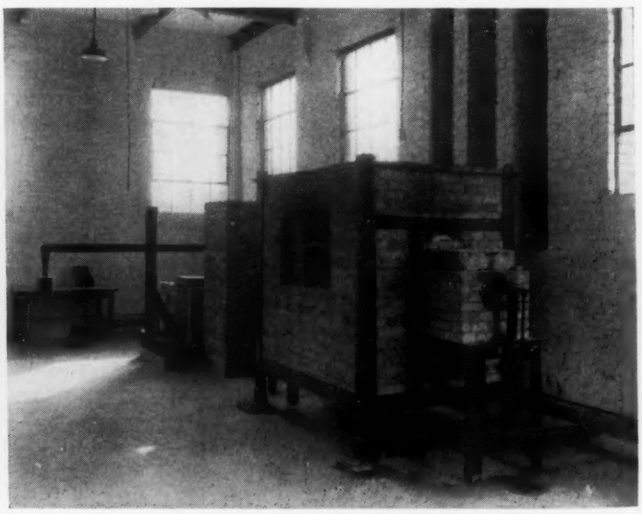


The third floor plan of the General Refractories laboratory where are located the chemical laboratory, balance room and laboratory offices

sented by experimental and commercial brick. These require a determination of those constants developed in such tests as spalling, crushing, reheating, transverse breaking, standard load and tests of a special nature. At all times, wherever possible, the standard A. S. T. M. tests for refractories are used in both the physical and chemical departments.

The physical testing laboratory is equipped with tensile and compression testing machines, a motor-driven testing sieve, a fusion furnace, heated by oxygen and acetylene gas, a general furnace, fired by oil and capable of producing a heat of 3000 deg. F., used for conducting spalling, reheating and slag tests, a special furnace for studying the disintegration of blast-furnace brick, a simulative navy type furnace for observing the effect of heat on brick and a standard A.S.T.M. furnace for testing the strength of brick under load at high temperatures. Practically all tests are made on full standard size brick rather than on briquettes.

Work table with fume hood in the general chemical laboratory on the second floor



A corner of the furnace room showing the load test furnace and the spalling and reheating furnace

The equipment of the small scale brick making plant includes a disc grinder, a gyratory riddle, a 3-ft. wet pan, a motor-driven hydraulic press capable of exerting 200 tons pressure and a small brick drying oven. For burning the experimental brick a small laboratory kiln is sometimes used. For much of the work, however, the full size brick kilns are used.

The basement of the building is used for the storage of test samples and for chemical sample preparation. Here are located a large fireproof vault for valuable records, and also lockers and showers for the staff.

According to members of the staff, one of their greatest aims is to help the consumers of the company's products by working with them on their individual problems. They say, in fact, that a great many of the new developments brought about in the manufacture of refractories are directly due to "the crying need" of users of the product, who present their troubles as practical research problems. Primarily, however, the purpose of the laboratory is to investigate and control the quality and handling of the raw refractory materials and to test thoroughly the finished products, both physically and chemically. Approximately one-half the staff's time is devoted to the routine control of manufacturing operations and the other half to research work of both practical and theoretical character.

The staff of the laboratory comprises 11 men, including Dr. R. P. Heuer, director of research; M. L. Bell, laboratory manager, and L. J. Trostel chief chemist. The writer is greatly indebted to these gentlemen for their cooperation in the preparation of this description of their laboratory.

The Belgian Cement Industry

By Dr. C. R. Platzmann
Consulting Engineer, Hamburg, Germany

THE BEGINNINGS of the Belgian cement industry date back to the beginning of the 19th century, when Roman cement was burned from lime-bearing clays (septarian clay) in kilns similar to those that served also for the production of lime. Furthermore, natural cement was produced in similar kilns, clay-bearing limestone serving as the raw material. Valuable deposits of this kind are found especially in the Tournai district in southern Belgium.

At the beginning of the 20th century a great advance began in the Belgian cement industry, but especially after the rotary kiln came into more general application. Today there are about 29 portland cement works which burn with rotary kilns. The raw material is supplied from the chalk and clay deposits found in various parts of the country. But a few plants utilize limestone which is mixed with clay or schist; these are in particular the plants in Riviere-Lustin and Ben-Ahin. The manufacturers in the Tournai district use clay-bearing limestone and clay.

The "thick slurry" process has been introduced for the handling of chalk and limestone as raw materials, in which the mixing and grinding of the raw mix takes place with the lowest possible quantity of water. The plants located near Tournai operate, on the other hand, on the dry process. The various mixing, grinding and burning machines are of course of various makes, but are nevertheless all adapted to the modern requirements in such a manner that an efficient and rational manufacture is the result. The table below gives the geographical distribution of the plants, the names of the concerns, and the raw materials being used:

GEOGRAPHICAL DISTRIBUTION OF BELGIAN CEMENT MILLS

Firm	Province	Place	Raw Material
Usines Dufossez et Henry	Hainaut	Croufestu	Chalk
Usines Levie Freres	Hainaut	Croufestu	Chalk
Ciments de Croufestu	Hainaut	Croufestu	Chalk
Ciments Belges d'Harmignies	Hainaut	Harmignies	Chalk
Ciments et Engrais Chimiques	Hainaut	Obourg	Chalk
Cimenteries et Briqueteries Reunies	Hainaut	Obourg	Chalk
Ciments de Thieu	Hainaut	Thieu	Chalk
Ciments Liegois	Luettich	Haccourt	Chalk
Ciments de Vise	Luettich	Lixhe	Chalk
Cimenteries et Briqueteries Reunies	Luettich	Loen	Chalk
Ciments de Lauage	Luettich	Lanaye	Chalk
Ciments de Huy	Luettich	Bas-Oha	
Ciments de Ben-Ahin	Luettich	Beu-Ahin	Limestone
Ciments Meuse-Brabant	Brabant	Orp-le-Graud	Chalk
Ciments Meuse-Brabant	Namur	Riviere-Lustin	Limestone
Cimenteries et Briqueteries Reunies	Audwerpeu	Raevels	Lime-bearing clay
Cimenteries et Briqueteries Reunies	Audwerpeu	Burase	Lime-bearing clay
Cimenteries et Briqueteries Reunies	Audwerpeu	Turnhout	Lime-bearing clay
Cimenteries et Briqueteries Reunies	Audwerpeu	Nive-les Boom	
Cannon Brand	Audwerpeu	Burght	
Ciments van der Heuvel	Audwerpeu	Hemix-em	
Carriere Bataille	Tournai	Gauraiu-Ramecroix	Clay-bearing limestone
Ciments de l'Eseaut	Tournai	Autoing	Clay-bearing limestone
Ciments du Tournaisis	Tournai	Autoing	Clay-bearing limestone
Etablissements Alexandre Dapsens	Tournai	Vaulx	Clay-bearing limestone
Franco-Belge	Tournai	Caloune	Clay-bearing limestone
Dumon Duquesne	Tournai	Vaulx	Clay-bearing limestone
T. B. Lenain	Tournai	Vaulx	Clay-bearing limestone
Louis Delwart	Tournai	Cherg	Clay-bearing limestone

The plants located in the Tournai district have produced for a long time only natural cement, but shortly before 1914 they started to change their plants to manufacture portland cement.

The annual production of the Belgian cement industry, which has an especially large export market, is about 2,500,000 metric tons, or 15,000,000 bbl. of 170 kg. (375 lb.) net each. All plants produce a high-grade cement; a few plants have changed recently to the manufacture of high early-strength portland cements.

In Hareu, near Brussells, the Societe Anonyme des Ciments de Buda produces iron portland cement. A few firms produce also slag cement in order to utilize profitably the blast furnace slag accumulating in the iron industry. Natural cement is still being burned near Tournai, but the production has been decreasing from 600,000 tons before the war to about 150,000 tons at the present.

Low wages, coal deposits located favorably for low freight rates, and the excellent canal system of the country make possible the production of cement at low cost, and these facts have contributed to give the Belgian cement industry a solid place in foreign markets.

Following the German and American example, the portland cement manufacturers have combined in an association, whose purpose is to increase the use of cement through propaganda. Besides, it is to serve also the scientific-technical upward development of the Belgian cement industry. A special aim is finally to guarantee the quality of the products of the members upon the domestic and foreign markets. For this purpose a central laboratory was created, which controls the products continually. In order to render this control effective, each member is required to declare and send his product under a registered trademark. A test certificate must accompany every order, showing that the cement embodies the correct characteristics for each necessary purpose, or that the cement harmonizes with the standards of the country to which it is sent. Furthermore, every member must bind himself to submit to the control of the above-named laboratory.

Properties of Fuller's Earth

TECHNICAL PUBLICATION NO. 207 of the American Institute of Mining and Metallurgical Engineers, Inc., New York, is a paper read at the Los Angeles meeting last September. This paper by C. W. Davis and L. R. Messer represents work done under a co-operative agreement between the United States Bureau of Mines and the University of Nevada, and deals with some of the properties of fuller's earth.

Fuel Economy in the Rotary Kiln Burning Portland Cement Clinker*

By Robert D. Pike
Pike and West, Consulting Engineers, Emeryville, Calif.

IN TWO PREVIOUS PAPERS† the writer has developed ideas and data which in this paper are employed for calculating rational performance curves of rotary kilns and for predicting the outcome of proposed methods for increasing fuel economy.

The calculations involved in this work are rather complex and exceedingly tedious, and no attempt will be made here to explain them in detail. Suffice it to say that the rotary kiln has been studied as a heat-transfer tube made up of three major zones—the clinkering, the calcining and the preheating zones. Each solution or point on any of the curves presented in this paper has involved the fitting together of these three zones by trial and error, to give a self-consistent whole or unit corresponding to the actual rotary kiln. Of the three zones it has been considered that the calcining zone is the most important in the thermal sense, and the laws of heat transfer in this zone were developed analytically, leading to two equations, which furnished the starting point for all the solutions.

Equation 1 shows the length fo the calcining zone that will give maximum thermal efficiency. If there were no heat losses through the shell to the outside atmosphere, L_{2max} would be infinite, but by introducing into the analysis a term to allow for these losses L_{2max} becomes finite.

For maximum efficiency

$$L_{2max} = \frac{K_1 sd}{K_4 + K_5} \log_e \frac{K_4 T_r - (K_4 + K_5) T_2}{-K_5 T_r} \quad (101$$

Equation 2 gives the general relations for thermal efficiency in the calcining zone:

$$E = \frac{K_4}{(T_2 - t)\ (K_4 + K_5)^2 K_1 sd} \left[K_1 sd\ [(K_4 + K_5) T_2 - K_4 T_r] \right.$$

$$\left. \left\{ 1 - e^{-\frac{(K_4 + K_5) L_2}{K_1 sd}} \right\} + T_r L_2\ [(K_4 + K_5) K_4 - (K_4 + K_5)^2] \right] \times 100$$

where

d = internal diameter of calcining zone of kiln, feet
L_2 = length of calcining zone of kiln, feet
K_1 = pounds of gas per minute per square of diameter (mass velocity)
T_2 = temperature of gas entering calcining zone, deg. F.
T_r = temperature of calcination, deg. F.
t = temp. of outside atmosphere, deg. F.
s = mean specific heat of gases
K_5 = coefficient of heat transfer to outside atmosphere by conduction and convection, including numerical relation between surface of charge exposed and diameter d, B.t.u. per square foot per minute per deg. F.
K_4 = coefficient of heat transfer to charge by conduction and convection, including numerical relation between the surface of the charge exposed and the diameter d, B.t.u. per minute per square foot per deg. F.
E = thermal efficiency in calcining zone
E_{max} = thermal efficiency when gases leave calcining zone at temperature T_r
e = base of natural logarithms.
L_{2max} = length, in feet, of calcining zone when efficiency = E_{max}[2]

It has been necessary to assume, for the sake of simplicity, that the heat transfer numbers K_4 and K_5 are constants for any given mass velocity, K. The effect of mass velocity on these constants has been shown in a previous paper.

In utilizing the above equations as a starting point for the solutions, curves are plotted of which Fig. 1 is typical.

Equation 1 brings out the vital point that for maximum efficiency there is a definite linear relation between the length and diameter of the calcining zone; and the same is found to be true of the kiln as a whole.

Before proceeding with the presentation of the curves of the complete rotary, the writer wishes to make it clear that these curves are theoretical and not actual. To accumulate data for directly plotting such curves would take a lifetime and would probably not be possible of accomplishment. The phenomena in question are so complex that these curves necessarily have implicit in their make-up certain assumptions and approximations which make their absolute accuracy questionable. Nevertheless, it is believed that they present a correct approximation toward rationalization of the thermal relations of a rotary kiln, and as such should stimulate research and development along correct lines. This belief is strengthened by the fact that wherever the writer has tested the curves to predict the known results of practice the checks have been fairly satisfactory.

Effect of Size of Kiln

Fig. 2 shows the relation between length and fuel consumption per barrel for kilns having internal diameters of 6 and 8.5 ft., respectively. They show the gradual diminution of rate of reduction in fuel consumption for progressively greater lengths, and bring out the important point that, for any given length, the 6-ft. kiln uses less fuel per barrel than the 8.5-ft. kiln for same rate of firing. This difference becomes less as the length becomes greater, and presumably for kilns of infinite length the fuel consumption would be the same for all diameters. These curves show that for practical lengths the ratio of length to internal diameter has an important bearing on the fuel consumption.

The rate-of-firing constant, K_1, is in effect, at least approximately, in the observed kilns. It should be emphasized that these curves are based upon the assumption that the fuel fired in unit time remains constant.

Fig. 3 shows output *vs.* fuel consumption for four different sizes of kilns. They may be termed "load characteristic" curves. All the kilns shown in Fig. 3 are evidently overloaded in the thermal sense, but shorter kilns are overloaded far more than longer kilns. There is a striking difference between curve 1, for a kiln 125 ft. long, and curve 3, for a kiln 225 ft. long, in respect to the rate of increase of fuel consumption with increase of output. The curve for the shorter kiln is relatively steep and that for the longer kiln is relatively flat. This distinction is a very important one in favor of long kilns because it means that their output can be forced without increasing fuel consumption to the same extent as in shorter kilns.

If one should attempt to verify curve 1 of Fig. 3 by an actual test, a certain practical difficulty would be encountered which can best be understood by reference to the work of Grjimailo.* Probably in no type of furnace does the conception of hydraulics have more significance than in a rotary kiln. It must be obvious that the design should be so carried out that the entire perimeter is wetted by the hot gases. This is accomplished by giving the proper diameter to the upper end of the kiln. For example, in the kiln in curve 1, Fig. 3, the proper upper

*Reprinted from *Industrial and Engineering Chemistry*, April, 1929, by special permission of the publishers, the American Chemical Society.

†See ROCK PRODUCTS, Feb. 2, 1928, and April 27, 1928, issues.

*Williams, "Flow of Gases in Furnaces," John Wiley and Sons, 1923.

diameter, as calculated after Grjimailo for an output of 500 bbl. daily, is 47 in., but if the output is reduced to 350 bbl. daily the proper diameter is 36 in. The diameter is made a little smaller than demanded by theory, and the function of the stack is to provide enough draft to remove the gases from the stack base chamber, plus that extra amount of draft needed to speed the gases leaving the kiln beyond their natural velocity of free flow. Curve 1 could, therefore, only be checked in practice by making appropriate changes in the diameter of the upper end of the kiln to correspond to each setting of output.

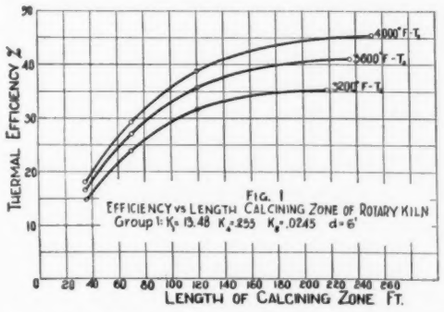


Fig. 1. Relation between length and diameter of kiln as regards efficiency

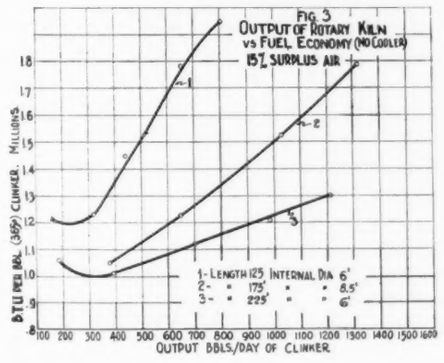


FIG. 3
OUTPUT OF ROTARY KILN
vs FUEL ECONOMY (NO COOLER)
15% SURPLUS AIR
1- LENGTH 125 INTERNAL DIA 6'
2- " 175' " 8.5'
3- " 225' " 6'
BTU PER BBL. (369) CLINKER. MILLIONS
OUTPUT BBLS/DAY OF CLINKER

Fig. 3. (Left) Output vs. fuel consumption for different size kilns

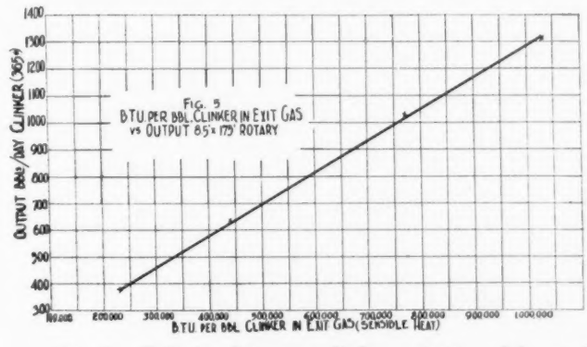


FIG. 5
BTU PER BBL CLINKER IN EXIT GAS
vs OUTPUT 8.5 x 175' ROTARY
OUTPUT BBLS/DAY CLINKER (369)
BTU PER BBL CLINKER IN EXIT GAS (SENSIBLE HEAT)

Fig. 5. Relation between clinker output and heat of waste gases

Effect of Surplus Air

Fig. 4 shows the effect upon fuel consumption of the observed kilns for various percentages of surplus air over that theoretically required for combustion. Surplus air is an important factor affecting fuel consumption and should be carried as low as possible. If combustion conditions are carefully controlled, it is possible to burn with practically no surplus air and with less than 1% carbon monoxide. No cement plant should be operated without some means of controlling surplus air.

Fuel Economy in Generation of Waste-Heat Steam

In computing the curve of Fig. 5 we have chosen a kiln 8.5 ft. inside diameter by 175 ft. long because such a kiln is typical of waste-heat boiler rotary-kiln installations. If all the steam required for power in a cement plant is to be derived from heat in the exit gases, these must contain from 600,000 to 700,000 B.t.u. of sensible heat and the output of the kiln will be between 820 and 940 bbl. per day.

The curve of Fig. 6 is of particular significance in connection with waste-heat boiler practice. The sensible heat in the exit gases must be between 600,000 and 700,000 B.t.u. per barrel if all the steam for power generation is to be derived from this source in waste-heat boilers. The corresponding fuel consumption is from 1,350,000 to 1,450,000 B.t.u. per barrel. In actual practice in dry process the latter figure is the more nearly correct. Obviously, the generation of sufficient waste-heat steam to run the plant is not compatible with high fuel economy of the rotary kiln itself.

The curves of Fig. 7 apply to kilns using the wet process and show the relation between temperature of exit gas and fuel consumption for varying percentages of water in the slurry. For given temperatures of exit gas the percentage of water in the slurry has a very great effect on fuel consumption. These curves are independent of kiln size, diameter or length.

The curves of Fig. 8 are for an 8.5-ft. inside diameter, 225-ft. long kiln using the wet process and show the relation between temperature of exit gas and output for dif-

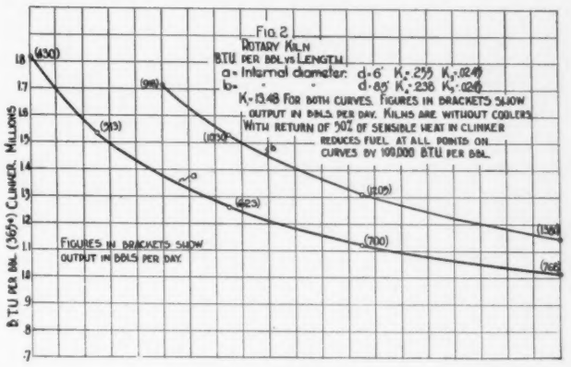


FIG. 2
ROTARY KILN
BTU PER BBL vs LENGTH
a- Internal diameter: d=6' K2=.255 K3=.0245
b- " " d=8.5' K2=.236 K3=.0245
K1=13.48 FOR BOTH CURVES. FIGURES IN BRACKETS SHOW OUTPUT IN BBLS PER DAY. KILNS ARE WITHOUT COOLERS
WITH RETURN OF 50% OF SENSIBLE HEAT IN CLINKER REDUCES FUEL AT ALL POINTS ON CURVES BY 100,000 BTU PER BBL.
FIGURES IN BRACKETS SHOW OUTPUT IN BBLS PER DAY.
BTU PER BBL. (369) CLINKER. MILLIONS

Fig. 2. (Right) Relation between length and fuel consumption

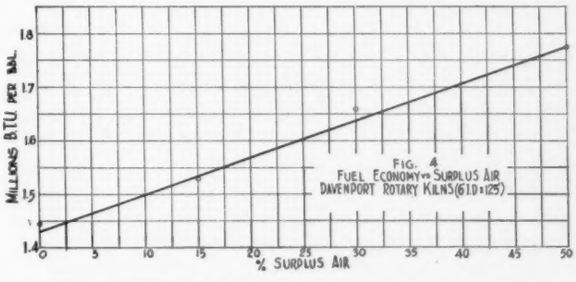


Fig. 4. Effect of surplus air on fuel consumption

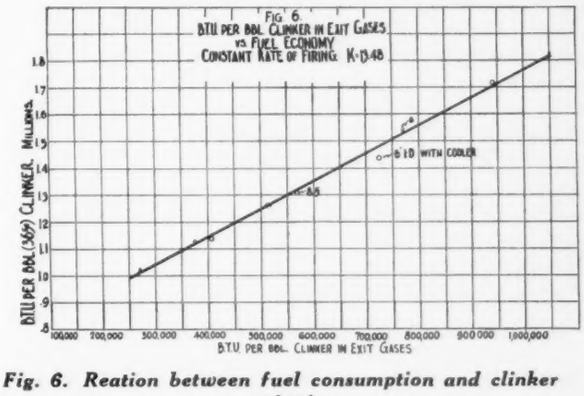


FIG. 6
BTU PER BBL CLINKER IN EXIT GASES
vs FUEL ECONOMY
CONSTANT RATE OF FIRING K=13.48
6.1 D WITH COOLER
8.5
BTU PER BBL. (369) CLINKER. MILLIONS
B.T.U. PER BBL. CLINKER IN EXIT GASES

Fig. 6. Reation between fuel consumption and clinker output

ferent percentages of water in the slurry.

The Efficient Rotary Kiln

The heat balance of the rotary kiln[2] shows the possibilities for reducing fuel consumption. It is easy to save 100,000 B.t.u. per barrel or more by use of a regenerative cooler, which preheats the secondary air for combustion by abstracting the heat from the hot clinker. A small amount of heat can be saved by placing insulating brick back of the fire brick in the upper reaches of the kiln, but it is unsafe to insulate the hotter parts. The balance and major part of the saving must come from reclaiming a portion of the heat of the exit gases. The most obvious step is to absorb this heat by the raw mix by increasing the length of the kiln, bearing in mind the important fact that a relation exists between diameter, length, fuel consumption and output of clinker.

Curve 2, Fig. 9, shows the load characteristic curve of a 6x240 ft. kiln with lower end expanded to 9.5 ft. in diameter inside the brick. Such a kiln, when equipped with cooler and when using theoretical air, producing 1200 bbl. daily, shows a fuel consumption of 1,050,000 B.t.u. per barrel. It seems safe to state that a consumption of 1,050,000 to 1,100,000 B.t.u. is the ultimate economy for ordinary rotary kilns using the dry process.

The theoretical fuel consumption of an ideal apparatus is 405,000 B.t.u. per barrel. The writer believes that an efficiency of 50 to 60% should be attainable in practice by use of special rotary kilns, and this would correspond to a fuel consumption of 674,000 to 810,000 B.t.u. per barrel.

In Fig. 9 are assembled three curves showing the output or fuel economy characteristics of three types of rotary kilns which are furnished with regenerative coolers that utilize the secondary air to abstract 100,000 B.t.u. per barrel from the hot clinker. A comparison of curves 2 and 1 shows the advantage of increasing the length of the kiln while keeping the diameter inside the brickwork constant. The longer kiln shows a better fuel economy at all outputs and the fuel economy is less affected by output than is the case with the shorter kiln. Curve 3 shows the curve for a special type of rotary kiln, proposed by the writer, in which devices are installed for improving heat transfer between the incoming raw mix and the outgoing gases in the upper 40 ft. of the kiln. It is not the purpose at this time to describe the mechanical features of this improved type of kiln, but merely to call attention to the possibilities for greater fuel economy which result from efficient countercurrent heat transfer between gas and raw mix in the upper end of the kiln.

Fig. 10 shows curves for a kiln of 8.5 ft. inside diameter in its practical length by 240 ft. long, and for the same kiln equipped with the special devices for improving countercurrent heat transfer in the upper end of the kiln proposed by the writer. These curves again bring out the fact that in the usual types of kilns of given length the 6-ft. kiln has a better fuel economy than the 8.5-ft. kiln; but the latter has a much greater output. The final fact which interests the engineer is actual commercial economy, and it is quite possible that under usual conditions the 8.5x240-ft. kiln will be more economical in a commercial sense than a 6x240-ft. kiln. This is a problem involving all commercial factors, including cost of fuel, labor, power, money and the respective investments per barrel per day of output. Such a study must pertain only to each special case, and is out of place here. The special device will give substantially the same fuel economy to the 8.5x240-ft. kiln as to the 6x240-ft. kiln, but the relative burden put upon these devices is greater in the former than the latter.

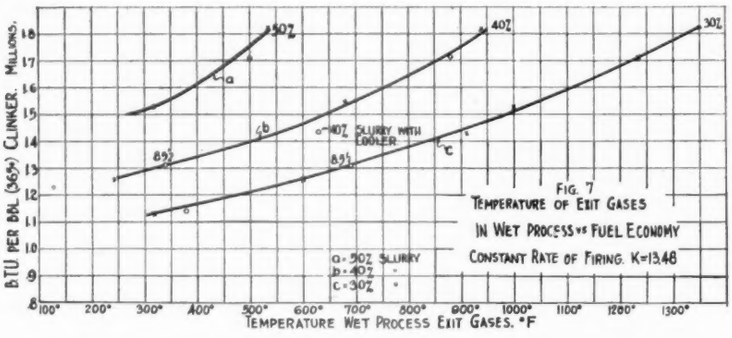


Fig. 7. Relation between temperature of exit gases and fuel economy (wet process)

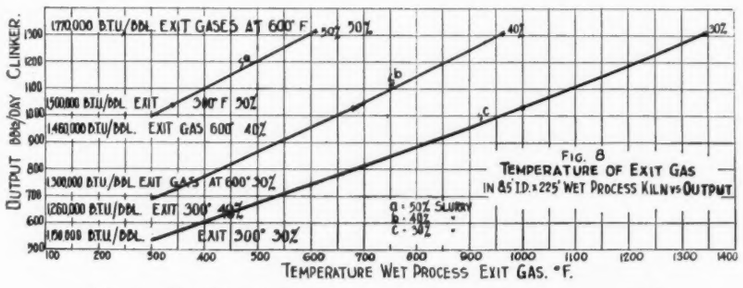

OUTPUT BBLS/DAY CLINKER.
1770000 BTU/BBL. EXIT GASES AT 600° F.
50% 30%
40%
30%
a
b
c
1500000 BTU/BBL. EXIT 300° F 30%
1460000 BTU/BBL. EXIT GAS 600° 40%
1300000 BTU/BBL. EXIT GAS AT 600° 30%
1260000 BTU/BBL. EXIT 300° 40%
1150000 BTU/BBL. EXIT 300° 30%
FIG. 8
TEMPERATURE OF EXIT GAS
IN 8.5 I.D. x 225' WET PROCESS KILN vs OUTPUT
a - 50% SLURRY
b - 40% "
c - 30% "
TEMPERATURE WET PROCESS EXIT GAS. °F.

Fig. 8. Relation between temperature of exit gases and clinker output

Arizona Strontium Deposits

THE DEPARTMENT OF THE INTERIOR has available a report by B. S. Butler of the Geological Survey covering the recently discovered strontium deposits near Aguila, Arizona. The deposit was inspected early this year by Mr. Butler.

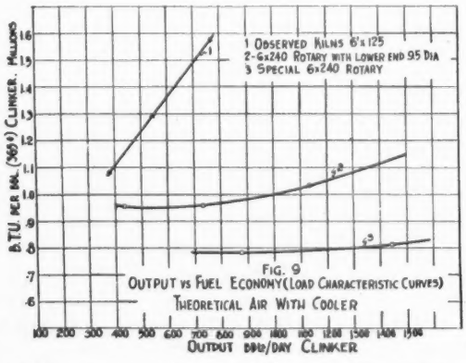

B.T.U. PER BBL. (365#) CLINKER. MILLIONS
1 OBSERVED KILNS 6'x125
2-6x240 ROTARY WITH LOWER END 9.5 DIA
3 SPECIAL 6x240 ROTARY
FIG. 9
OUTPUT vs FUEL ECONOMY (LOAD CHARACTERISTIC CURVES)
THEORETICAL AIR WITH COOLER
OUTPUT BBLS/DAY CLINKER

Fig. 9. Fuel economy characteristics of three types of kilns

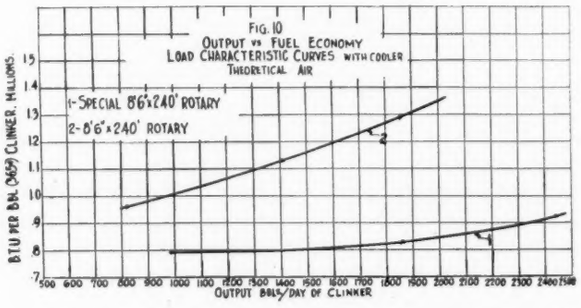


Fig. 10. Load characteristic of kiln equipped with special devices

New York Crushed Stone Association Entertained by John Odenbach

THE MAY MEETING of the New York Crushed Stone Association was held on the seventh at the new home of John Odenbach, president of the Dolomite Products Co., at Rochester.

The session was one of the most interesting and unique of any ever held by the association, as no previous meeting could possibly have had the surroundings that Mr. Odenbach provided for his guests.

We are inclined to believe that Mr. Odenbach had just such occasions as this in mind when he designed his beautiful home, for most certainly a home with all the means for entertaining a gathering of this kind does not come by chance or through the ordinary architectural channels, but is the result of a great amount of thought and careful planning, and we are further inclined to believe after seeing some of Mr. Odenbach's operations that he does nothing haphazard or by guesswork, but only acts to follow previously well-thought and definite plans.

Mr. Odenbach has won fame in the rock products industries as a producer of original ideas, and in the vicinity of Rochester no one refers to *crushed stone*, but to dolomite instead, and no one can mention dolomite without at least mentally connecting it with John Odenbach. His success in the crushed-stone business can be attributed in a measure to his keen understanding of human nature and the use of every opportunity that presents itself to put the name "dolomite" before the public. In this new home is shown the master hand of an artist-engineer combining to demonstrate to the city of Rochester and the world in general that a fireproof home can be built, if necessary, of dolomite entirely.

The House That "Dolomite" Built

The home is not only built of dolomite rock-products materials, but has been carried through in such an artistic and beautiful manner that one marvels that such could be possible even with the multitude of other building materials available. The entire 14-room house is constructed of nothing but dolomite products, cement and steel.

Dolomite has been used for flaggings and walkways as well as the porch floors, this stone being taken from the top portion of his quarry, and is marked with striations from glacial sources. The baseboards, window sills and portions of the floors are highly polished slabs of dolomite, some slabs showing fossiliferous markings. The walls, ceilings and even the tiled roof are of concrete using dolomite aggregates.

We could dwell at length on the artistic manner in which the rooms have been arranged, their softly tinted walls, the means for radio reception in practically all the rooms, the doors that can be opened by electrical means from remote portions of the house, ventilation system and other things.

Perhaps it is rather unusual in reporting a convention to dwell on the house in which the convention was held, but, as we said at the outset, we believe the house was built not only as a model home but with his fellow members of the New York Crushed Stone Association in mind, and John Odenbach's hospitality and home was the convention.

The business meeting was called to order by James Savage, president, presiding, and after the reading of the minutes of the previous meeting by A. S. Owens, secretary, the members at once launched into an informal discussion as to the desirability of the association adopting a uniform code of credits.

No action was taken toward the adoption of such a code, but the discussion brought out the various angles of the proposition and that perhaps a committee could formulate such a code that would be acceptable to all.

The whole proposition was based on an expressed desire of the state contractors' association, which is asking the material dealers of New York to be more strict with credit so that the smaller fly-by-night contractor will not be able to figure on contracts too large for his capital. Practically all of the members agreed that some standard form of credit should be adopted whereby after a definite period of time, if payments had not been made, shipments to that contractor could be cut off. The discussion centered mostly on the length of time to give a contractor before cutting off his supply. No action of any kind was taken, but the matter held over for future discussion.

After hearing the report of the membership committee headed by George E. Schaefer, and introduction of visiting guests, the business meeting closed, and the members proceeded to the basement, where a banquet table had been provided.

The appetites of all the visitors had been sufficiently whetted to thoroughly enjoy the baked clams so abundantly supplied.

Pointers on Blasting Efficiency

After toasts to the hospitality and good fellowship of their host and hostess, Mr. and Mrs. Odenbach, the association's president, Mr. Savage, introduced P. E. Lewis of E. I. du Pont de Nemours and Co., who gave a very interesting and instructive talk on the use of detonators.

Mr. Lewis pointed out that the location of the cap or detonator with respect to the charge was of great importance, as the cap should be pointed so that its long axis would center and parallel the long axis of the charge, with the closed metallic or "business end" of the cap pointed in the direction of the charge to be detonated. He further pointed out that the business end of the cap should be pointed to the line of greatest resistance, and by means of diagrams showed how this could be accomplished.

He discouraged the more or less common practice of inserting a cap into a stick of powder at an angle, as detonators used in this manner are not only a menace to the man lowering the charge, as the end of the cap might strike against the wall of the drill hole and explode, but when this charge has been tamped the tendency is for the cap to orient itself at right angles to the long axis of the dynamite charge, thereby causing the energy of detonation to be exerted on the wall of the drill hole and not on the dynamite itself.

He also brought out the fact that the value of a detonator lies in the strength of the blow struck—not the volume of the blow, but the rate of its detonation—and that it is impossible to use too strong a detonator. The stronger the better, as it insures more complete and quicker powder detonation.

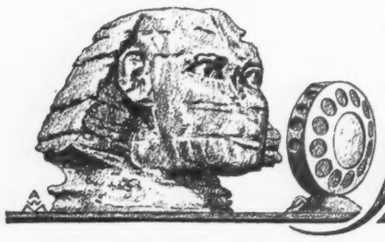
Mr. Lewis described the history and mechanical construction of the new detonator "Tetryl" which the du Pont company is sponsoring, stating that owing to its extreme high rate of detonation (22,000 ft. per sec.) compared to mercury fulminate (9600 ft. per sec.), better blasting efficiency could be obtained by its use. Hence this detonator strikes a harder blow than mercury fulminate. He further pointed out that it was much safer than the older type, as mercury fulminate would explode if struck by a 2-oz. steel ball falling 4 in., whereas this detonator would require a 40-lb. steel ball dropping 6 in. to detonate.

William A. Anderson of the Hercules Powder Co. asked about the construction of this cap with reference to the "booster," a necessary part of this new detonator, and Mr. Lewis explained it consisted of a small charge of potassium chlorate ($KClO_3$) and mercury fulminate placed on top of the "Tetryl."

At the conclusion of the talk by Mr. Lewis the formal session ended.

Attending Members and Guests

Buffalo Crushed Stone Co.: J. W. Savage, F. W. Schmidt.
Dolomite Products, Inc.: Harvey Clark, R. Howland, Charles Odenbach, John Odenbach, M. P. Odenbach, Arthur Sickles, Frank Wadell.
E. I. du Pont de Nemours and Co.: P. E. Lewis, B. H. Norton.
General Crushed Stone Co.: L. E. Croll, O. M. Graves, Frank S. Jones, James MacComb, Grover J. Murphy, F. C. Owens, John Rice, George E. Schaefer, A. G. Seitz, W. L. Sporborg.
Genesee Stone Products Co.: D. N. Boice, C. L. Buchholtz, A. B. Caldwell.
Hercules Powder Co.: Wm. A. Anderson.
L. and M. Stone Co.: Wm. McGrew.
LeRoy Lime and Stone Co.: J. L. Heimlich, D. L. Moore.
Marion Steam Shovel Co.: D. L. Cheney.
Peerless Quarries, Inc.: A. S. Owens.
ROCK PRODUCTS: W. B. Lenhart.
Solvay Sales Corp.: J. H. Kaiser.
Union Explosives Co.: H. S. Conley.
Wickwire-Spencer Steel Co.: W. E. Foote.



Hints and Helps for Superintendents

Plain Marking of Stone Sizes Proves Helpful

THE proper marking of sizes of crushed stone carried in a particular storage bin or pile which will obviate mistakes is extremely desirable and helpful.

The Camoa Quarry Co. are large crushed stone operators on the island of Cuba. At its crushing plant at Jamaica, a small village about 30 miles southeast of Havana, it has a very neat distribution yard which

Contents of each bin is plainly marked on supporting concrete posts

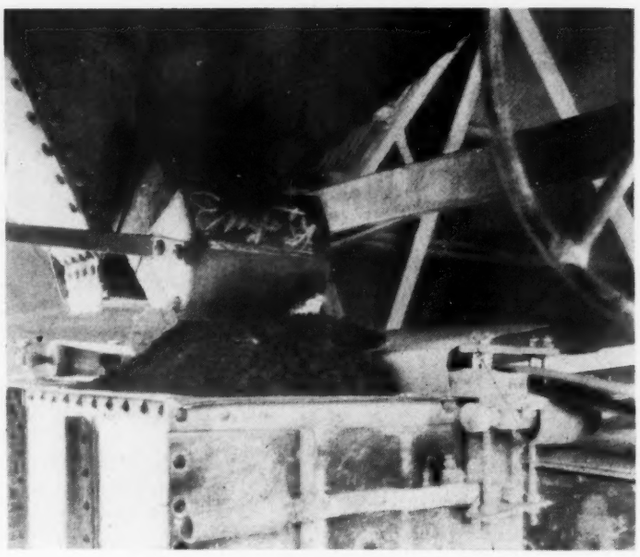
includes an unloading system and storage arrangement that permits excellent bin arrangement and plain marking of different stone sizes.

In constructing the type of bin used advantage has been taken of the rolling nature of the locality so that the loaded standard gage gondolas are spotted on the structure without any unusual grades or incline to overcome. The trestle supports are heavy concrete posts on which rest 24-in. I-beams and the hoppered bins are constructed and carried between the parallel members suitably tied with cross rods.

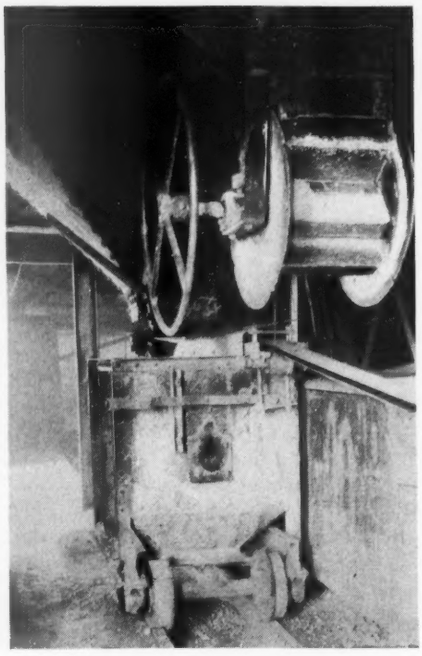
Clinker Car Haulage by Endless Belt

IN the plant of the Canada Cement Co., Ltd., Winnipeg, Manitoba, the clinker is measured into a rectangular, mine-type, bottom-dump car holding seven barrels of material. Immediately alongside the clinker hopper serving this car is a similar hopper containing the gypsum which is fed to the clinker car by a quadrant gate, the pockets of which hold a known amount of gypsum. By turning the handle on this gate the proper amount of gypsum can be measured into the car.

To move this car back and forth on its track between the clinker, gypsum and mill feed bins, the car is handled by an ingenious arrangement consisting of a clutchlike device fitted to one end of the car through which both upper and lower members of a 4-in. belt pass. The belt passes over suitable drive and tail pulleys near each end of the track, and is driven by a small motor. When the operator wishes to move the car he throws a lever causing the clutch fastened to the car to grab the upper member of the moving belt, if he wishes to go in the opposite direction, he reverses the clutch causing it to grab the lower belt. The operator rides the car. The maximum distance traversed is approximately 75 ft.



Another view of the car and clutch



The quadrant gate measures out the gypsum, after which the car is transferred by the belt passing through clutch mounted on top of car

Air Separator for the Laboratory

By R. E. ZINN

(Reprinted from *(Industrial and Engineering Chemistry)*)

IN experimental work with finely ground solids it is often necessary to obtain a physical separation which is not readily done with the regular 100- to 200-mesh sieves. This is particularly true in cases where the material does not screen easily because it is too light or because the particles adhere to one another; also, it may be desired to effect a separation of mamaterial finer than 200 mesh.

A convenient air separator suitable for qualitative separation has been successfully built and used by the writer. Such a device may be easily and quickly made from materials that are generally available about a laboratory. Its construction will be evident from the following:

Secure a 5-lb. (2.3-kg.) can, a 2-lb. (0.9-kg.) can, and a ½-lb. (0.23-kg.) can. Cut openings and tongues in the 2-lb. can as in Fig. 1. Also cut a 1-in. hole in the bottom and insert a stopper. Cut slots in the 5-lb. can cover to fit the tongues;

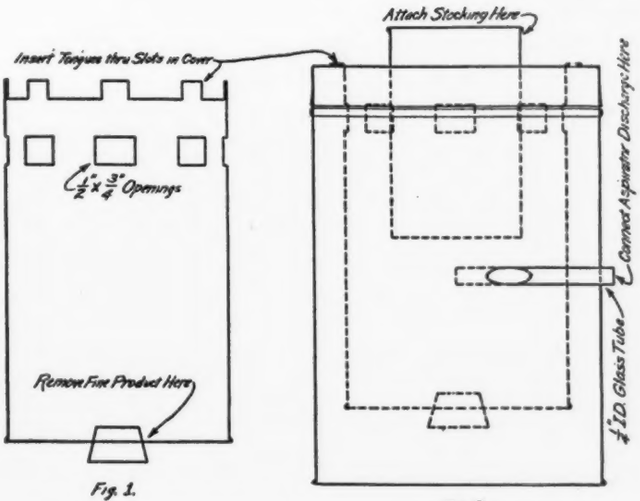

Attach Stocking Here
Insert Tongues thru Slots in Cover
½" x ¾" Openings
Remove Fine Product Here
Connect Aspirator Discharge Here
¼" O.D. Glass Tube

Fig. 1. Fig. 2.

Drawing showing method of constructing air separator

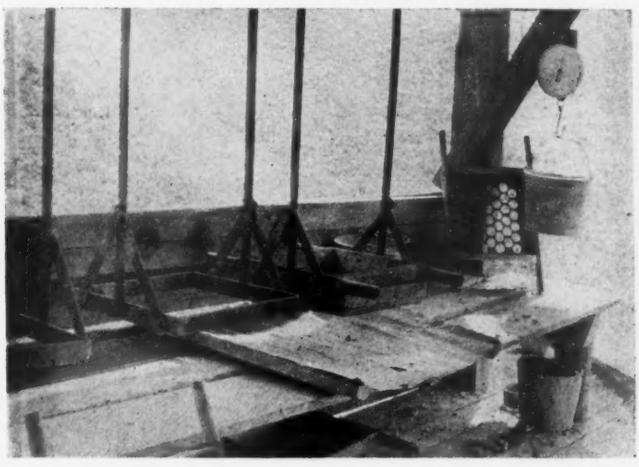
cut a hole in this cover to fit the ½-lb. can, which has had the bottom cut out of it. Make a hole for the inlet tube as shown in Fig. 2, and secure the tube to the can tangentially with deKhotinsky cement. Seal the pieces fitted through the cover with this cement also. Attach a muslin or canvas stocking 4 × 24 in. (10 × 60 cm.) to the small can with a drawstring.

Feeding is accomplished through suction from an aspirator consisting of a ¼-in. (6-mm.) glass T into which compressed air is conducted through a ⅛-in. (3-mm.) tube and nozzle to the intersection of the arms of the T. The outlet end of this aspirator is connected to the inlet tube of the assembled air separator with a short rubber tube. The material to be treated is carried by the air stream to the annular space just within the large can, where the velocity is decreased sufficiently to drop out the coarser material. The finer particles are further carried by the air current through the openings just below the cover and into the central space, where they are deposited. They may be recovered, without removing the stocking, through the hole which is closed with the stopper. Any material which is carried past this chamber is arrested in the stocking filter. With a little experience an operator can control the degree of separation as desired by changing the amount of compressed air to the aspirator.

Sampling Crushed Stone

THE sampling methods used at the Camp quarries of the Florida Crushed Stone Co. near Brooksville, Fla., one of a very few in that state which produces a rock sufficiently hard for concrete aggregate or asphaltic road surface filler, are not only interesting but necessary, as the requirements in that state are strict and constant vigilance is necessary to maintain the proper proportions of the several sized materials going to make up the shipments.

The several different sized materials produced fall into bins over the loading tracks. A belt conveyor passes under these bins paralleling the long axis of the bins. The rock is drawn from gates on to this belt, which discharges into the car spotted at the end of the conveyor. As a car is being loaded the operator, by means of a scoop mounted on the end of an extended arm, fills an ordinary bucket with the rock being loaded and weighs out 25 or 50 lb. in a pair of spring scales.



Swings and screens for coarse aggregate analysis

The weighed sample is screened through screens of proper sized holes. The screen proper is rectangular, with wood sides about 3 in. in depth.

For shaking, these rectangular units are placed in a square saddle mounted on two ½-in. iron rods and suspended as is an ordinary playground swing. After screening the samples the percentages of the various sized materials going to make up the car are recorded.

Earn $5 in 5 Minutes

TAKE a pencil and paper and make a sketch of some kink you have worked out to make things easier. Send it to the editor with a brief description. Get a check for $5.—The Editor.

Conveyor Chain Repairs Easy with This Turnbuckle

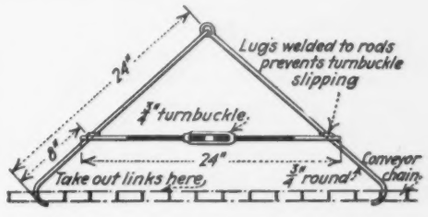
(From *Engineering and Mining Journal*)

TROUBLE is always experienced when changing links on conveyor chains, especially while replacing broken or worn-out links. Formerly we used a straight turnbuckle to hold the chain on both sides of the broken links, while taking out the slack until the chain was repaired, says R. M. Thomas of Denver. This was difficult at times because the turnbuckle was so close to the chain it would cause the latter to buckle in the middle, making it hard to place the two ends together. To get a bar in the turnbuckle to clear the chain was a long and tedious operation, moreover. Changing the links was looked forward to with dread.

Design of the turnbuckle illustrated did away with this trouble, giving room to work and cutting the time of changing the links to one-fourth the former amount. The end rods were made of ¾-in. round steel, one end being turned to fit the conveyor chain, the others being linked together, making an eye joint.

Eight inches from the conveyor end a lug or collar was placed on the end rods, welding them in place. This was to prevent the turnbuckle sliding on the rods away from the chain. The end of the turnbuckle was made to fit around the ¾-in. rods, sliding on from the conveyor end until they rested against the collars. If more slack than the turnbuckle can make when all the way up is to be taken out of the chain, the links should be held in this position with a wire or chain, the turnbuckle taken off and another hold obtained on some of the other links when the turnbuckle is screwed out to the end.

This turnbuckle was used for 4-in. links 1⅛-in. thick, but can be applied to smaller or larger chains as well. It is so much superior to anything else we have used that we feel we ought not to be without one or two in the repairman's kit.



Pulling the two ends of a conveyor chain with turnbuckle

Joseph F. Haggerty

IN THE DEATH of Joseph F. Haggerty, president of the National Gypsum Co., Buffalo, N. Y., the gypsum industry mourns the loss of one of its leaders. Attracted to the industry nearly 20 years ago by a clear conception of the inherent possibilities and potentialities of the wallboard idea, Mr. Haggerty devoted his life to the furtherance of a greater public appreciation of the diversified utility of gypsum products.

The impress of Mr. Haggerty's character has been manifest not only in the rapid and successful development of the company that he headed but has been equally evident to the gypsum industry as a whole. Eager to see the industry advance, because his keen sense of analysis convinced him that the eventual market for gypsum products had merely been touched, Mr. Haggerty was ever eager to assist in the industry's progress and improvement.

Mr. Haggerty became associated with the wallboard business in 1911, coming to the Beaver Board Cos. after eight years' experience with the sales development department of the Sherwin-Williams Co. Under Mr. Haggerty's direction, as vice-president in charge of sales and production, the business of the Beaver Board Cos. rapidly advanced from a gross of $150,000 to annual sales in excess of $24,000,000.

During the 11 years that Mr. Haggerty piloted the sales activities of the Beaver Board organization the basic idea of wallboard construction was sold to the American and Canadian public by aggressive national advertising and the intensive efforts of a large sales force. The success of the Beaver Board idea focused a great deal of attention upon the possibilities of wallboard construction and was a major incentive in the development of gypsum wallboard.

Foreseeing the eventual ascendency of plaster wallboard, Mr. Haggerty, in 1922, organized the Gypsolite Co., which subsequently became a branch of the Universal Gypsum Co. The National Gypsum Co. was organized under Mr. Haggerty's direction in 1926. Associated in the development of this company were such well-known gypsum men as C. E. Williams, former vice-president of the Universal Gypsum Co., and Melvin H. Baker, former sales manager of the Beaver Board Cos.

Within the brief span of the three years in which the National Gypsum Co. has been in active operation, the manufacturer of "Gold Bond" gypsum products has become the third largest factor in the industry, and the company is now the second largest producer of gypsum wallboard. In addition to the original plant at Clarence Center, N. Y., an exceptionally well equipped board and plaster mill has been placed in full operation at National City, Mich., and the modern lime plant of the Luckey Lime and Supply Co. has been acquired at Luckey, Ohio.

Mr. Haggerty became well known to his associates in the industry during the World War when he was president of the Wallboard Manufacturers Association and chairman of the war service committee. Through his efforts the facilities of the wallboard makers were placed at the command of the government and many million feet of board were used to build comfort into the huge training cantonments.

It was the genius of Mr. Haggerty's personality to inspire exceptional confidence and

—Photo by Pohle

Joseph F. Haggerty

loyalty in all who were associated with him. He was always modest in rating his personal achievements, although he possessed the rare art of leadership to the point where his entire organization was imbued with an irresitible aggressiveness that assured prompt success. He delighted in the progress of the men who joined his organization and took a keen interest in the development of the younger members of his staff, many of whom came with him as office boys and progressed to important executive positions.

The death of Mr. Haggerty was unexpected, the end coming suddenly after an attack of pneumonia from which he was apparently recovering. Mr. Haggerty was born in Derby, Conn., 51 years ago and he was buried there on Monday, April 29.

As noted elsewhere in this issue, Melvin H. Baker was elected president of the National Gypsum Co. to fill the vacancy created by Mr. Haggerty's death.

A. W. King to Head Service Department of Cowham Engineering Co.

A. W. KING, who for the past two years has been associated with the structural and technical bureau of the Portland Cement Association, has resigned to become manager of the service department of the Cowham Engineering Co., Chicago, Ill., effective May 16, 1929.

The Cowham Engineering Co. has been actively engaged in the portland cement industry for the past 25 years and is now associated with the following companies in their management and operation: Consolidated Cement Corp. with mills at Cement City, Mich., Mildred and Fredonia, Kan.; Florida Portland Cement Co., with a mill at Tampa, Fla.; Signal Mountain Portland Cement Co. with a mill at Chattanooga, Tenn. Realizing the invaluable service that can be rendered to its buyers and users of portland cement from the standpoint of engineering and technical aid, the Cowham Engineering Co. has established a service department with Mr. King as its head.

Mr. King is particularly fitted to head such a department both from the standpoint of education and training Prior to his connection with the Portland Cement Association he was in charge of the materials testing laboratory of the Bureau of Science, Manila, P. I., for 10 years, during which period he was appointed professor of civil engineering in the College of Engineering, University of the Phillippines. Later he was connected with the Kalman Floor Co. as sales engineer and for two years was engaged in technical, research and promotion work for the Atlas Lumnite Cement Co. Mr. King is well known as the author of a number of scientific and technical papers which have had widespread circulation.

Monolith Midwest Cement Making Shipments

REGULAR SHIPMENTS of cement now are being made to all parts of the mid-continent territory, embracing Wyoming, Colorado, western Kansas, Nebraska and contiguous sections, from the new $2,000,000 plant of the Monolith Portland Midwest Co., near Laramie, Wyo., according to an announcement by officials of the concern, which is closely allied with the Monolith Portland Cement Co. of California.

Orders for products of the plant had been received even prior to the start of manufacturing operations, one such contract providing for supplying stucco for the Alexander Industries plant and airport buildings at Colorado Springs, Colo. This is said to have been one of the largest stucco orders ever let in the history of Colorado.

Formal opening of the plant, or rather a celebration of its opening, is scheduled for June 22.

Editorial Comment

Valedictory to the Tariff Issue!

A certain Producer who, like most of us, is a strong supporter of "vested interests" when his own "vest" is likely to be even temporarily included—but who, to be fair, is also a student of economics—writes us about recent editorials on the tariff as concerning sand and gravel and crushed stone. This gentleman thinks the ROCK PRODUCTS tariff editorials are inconsistent; we submit that he is wrong. His conclusion as to ROCK PRODUCTS inconsistency is based on two erroneous premises: First, that our earlier editorials were *against* a tariff on Canadian sand and gravel and crushed stone; second, that our stand in the May 11 issue was a reversal because we said "if a tariff on crushed limestone is justified, undoubtedly a tariff on other crushed stone and sand and gravel is justified."

In our earlier editorials we did our duty to the industry as we see it. We did not oppose a duty on these commodities, we merely questioned whether the need of it could be as readily established as the need for a tariff on portland cement. Instead of reflecting merely the point of view of the few interested producers who wanted a tariff, we took the point of view of industry at large, and of our country as a whole, and seriously and honestly questioned the defensibility of a protective tariff on imported Canadian sand, gravel and commercial crushed stone for *economic reasons*, which the tariff is supposed to be designed to meet. We have not changed this point of view—and that it accurately represented the views of those both within and without the industry, whose personal interests were not at stake, is shown in the failure to include any reference to these commodities in the tariff schedule; although no one appeared at the committee hearings to oppose the producers' application for a tariff, nor were any briefs filed in opposition to a tariff. It was evidently rejected because it did not ring true economically in the opinion of the Ways and Means Committee and its technical advisor, the United States Tariff Commission.

Between our earlier editorials on the tariff as an economic instrument to place competition between high-wage-paying American producers and low-wage-paying foreign producers on a more equitable basis (in order to preserve our high standard of living in the United States) we paid a visit to Washington and to the office of the Ways and Means Committee of the House of Representatives. We brought away with us five large volumes of petitions, briefs and reports of hearings relating to the free list only. Much in these volumes is interesting and instructive reading, and a study of them and of the subsequent tariff bill is quite enlightening as to how tariffs are made.

It is evident enough that other than economic considerations influence tariffs. Crushed limestone has been in the tariff schedule for many years at 5 cents a hundred, or $1 per ton. It remains in the new schedule. We do not know the history of this; evidently somebody wanted limestone there; and there it is. Sand, gravel and crushed-stone producers reasoned that if a duty of $1 a ton was justified on crushed limestone it was also justified on their commodities, which compete everywhere with crushed limestone as concrete aggregate. (We believe crushed limestone was originally included as part of the lime schedule and its advocates had in mind its uses other than as an aggregate.) We doubt if the interests which had crushed limestone put into the schedule at $1 per ton could justify this tariff on present economic grounds; but they got it there before the economic features of the protective tariff system were emphasized as they are today.

Waving aside then the whole economics of the tariff issue, as one must to a certain extent after seeing how the tariff is made, any reasonable person would have to admit that *if* crushed limestone is entitled to $1 a ton protective duty *undoubtedly* sand, gravel and other crushed stone are also entitled to the same protection. There is nothing really inconsistent in that. We have merely been disillusioned as to the importance of the economic features of the tariff in the opinion of those who make tariffs. But sand, gravel and crushed-stone producers asked for their tariff at a time when the tariff is under closer scrutiny of the economic experts of the tariff commission than ever before; and perhaps their political influence was not as great as that of limestone producers in years past. In other words, the economic issue while by no means the sole consideration, is more so now than formerly.

ROCK PRODUCTS does not flatter itself with the belief that anything it has published editorially has had any influence in tariff making. It was not written with that in mind. What was intended was to create a little interest in the tariff issue on the part of producers of commodities who hitherto have taken no interest whatsoever in the tariff. It is the editor's hope that these editorials, if they were read at all, have been as enlightening to the readers as to the why and wherefore of tariff schedules, as has been the experience of the editor in connection with them. Certainly nothing could demonstrate better the need of business men in government than the present handling of the tariff, which is such a vital factor in the business of all of us, whether we seek protection for a commodity we make, or depend entirely on general prosperity for the prosperity of our particular business. What ROCK PRODUCTS has been endeavoring to do is to wake up, rather than to make up, your mind in regard to the tariff issue.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	5-22-29	92	.....	
Alpha P. C. new com.	5-20-29	50	53	75c qu. Apr. 15
Alpha P. C. pfd.	5-20-29	116	.....	1.75 Mar. 15
American Aggregates com.[45]	5-22-29	40	42	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	5-22-29	107	109	
American Brick Co., sand-lime brick	5-20-29	13½	14½	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	5-20-29	84	86	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	5-22-29	99	101	
American Silica Corp. 6½'s[49]	5-22-29	96	100	
Arundel Corp. new com.	5-21-29	41½	.....	50c qu. Apr. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[16]	5-22-29	70	80	
Atlas P. C. com.	5-20-29	47	50	50c qu. June 1
Atlas P. C. pfd.	5-18-29	50	.....	66⅔c qu. Apr. 1
Beaver P. C. 1st 7's[20]	5-17-29	98	100	
Bessemer L. & C. Class A[4]	5-20-29	34	34¾	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	5-20-29	97¾	98¼	
Bloomington Limestone 6's[29]	5-22-29	90	92	
Boston S. & G. new com.[16]	5-18-29	19	22	
Boston S. & G. new 7% pfd.[16]	5-18-29	48	50	
Canada Cement com.	5-20-29	28	.....	
Canada Cement pfd.	5-20-29	97	97½	1.62½c qu. June 29
Canada Cement 5½'s[11]	5-17-29	99¾	100½	
Canada Cr. St. Corp. 1st 6½'s[11]	5-17-29	98	100	
Canada Gyp. & Alabastine	5-20-29	105½	106	75c Jan. 2
Certainteed Prod. com.	5-21-29	24	25	
Certainteed Prod. pfd.	5-20-29	55	60	1.75 qu. Jan. 1
Cleveland Quarries new st'k	5-21-29	70	.....	50c & 25c ex. June 1 & 50c Sept. 1
Columbia S. & G. pfd.	5-20-29	89½	92	
Consol. Cement 1st 6½'s, A[42]	5-22-29	92	95	
Consol. Cement 6½% notes[29]	5-22-29	79	81	
Consol. Cement pfd.[29]	5-22-29	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	5-17-29	101	103	
Consol. S. & G. com. (Canada)	5-20-29	.....	18	
Consol. S. & G. pfd. (Canada)	5-20-29	88	89	1.75 qu. May 15
Construction Mat. com.	5-21-29	28	29	
Construction Mat. pfd.	5-21-29	44	45	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	5-17-29	97	99	
Coosa P. C. 1st 6's[29]	5-22-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	5-18-29	90	.....	
Coplay Cem. Mfg. com.[40]	5-18-29	15	.....	
Coplay Cem. Mfg. pfd.[40]	5-18-29	75	.....	
Dewey P. C. 6's[30] (1930-41)	5-22-29	99	.....	
Dewey P. C. 6's[30] (1942)	5-22-29	101	.....	
Dolese & Shepard[3]	5-22-29	110	115	$2 qu. July 1
Edison P. C. com.[39]	5-18-29	10c	.....	
Edison P. C. pfd.[39]	5-18-29	25c	.....	
Giant P. C. com.[25]	5-18-29	40	43	
Giant P. C. pfd.[25]	5-18-29	38	40	
Ideal Cement, new com.[33]	5-18-29	74	76	75c qu. Apr. 1
Ideal Cement 5's, 1943[33]	5-18-29	100	102	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	5-22-29	100	110	
Indiana Limestone 6's	5-18-29	90	90½	
International Cem. com.	5-21-29	86½	87	$1 qu. June 28
International Cem. bonds 5's	5-21-29	103	104	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	5-17-29	92	95	
Kelley Is. L. & T. new st'k	5-21-29	55	56	62½c qu. Apr. 1
Ky. Cons. Stone Co. com.[48]	5-17-29	14	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	5-17-29	14	15	
Ky. Cons. Stone 6½'s*[48]	5-17-29	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 Sh. 7% cum. pfd. & 1 sh. com. stock)	5-17-29	99	102	
Lawrence P. C.	5-20-29	93	98	
Lawrence P. C. 5½'s, 1942	5- 8-29	91	94	
Lehigh P. C.	5-21-29	53	55	62½c qu. May 1
Lehigh P. C. pfd.	5-21-29	110	110½	1¾% qu. July 1
Lyman-Richey 1st 6's, 1932[13]	5-18-29	98	100	
Lyman-Richey 1st 6's, 1935[13]	5-18-29	97	99	
Marblehead Lime 6's[14]	5-17-29	98	100	
Material Service Corp.	5-23-29	.....	30½	50c qu. June 1
Mich. L. & C. com.[6]	5-18-29	40	.....	
Missouri P. C.	5-21-29	42½	43	50c qu. May 1
Monolith Midwest[9]	5-16-29	8½	10	
Monolith bonds, 6's[9]	5-16-29	97	98	
Monolith P. C. com.[9]	5-16-29	14	14½	8% ann. Jan. 2
Monolith P. C. pfd.[9]	5-16-29	9	9½	
Monolith P. C. units[9]	5-16-29	32	33½	
National Cem. (Can.) 1st 7's[38]	5-18-29	98	.....	
National Gypsum A com.[3]	5-22-29	20	22	
National Gypsum pfd.[3]	5-22-29	50	52	
Nazareth Cem. com.[26]	5-17-29	25	30	
Nazareth Cem. pfd.[26]	5-17-29	100	105	
Newaygo P. C. 1st 6½'s[29]†	5-22-29	102½	.....	
New Eng. Lime 1st 6's[14]	5-17-29	95	97	
N. Y. Trap Rock 1st 6's	5-21-29	98½	.....	
North Amer. Cem. 1st 6½'s	5-20-29	73	75	
North Amer. Cem. com.[26]	5-22-29	5	7	
North Amer. Cem. 7% pfd.[26]	5-22-29	20	30	
North Amer. Cem. units[29]	5-22-29	30	40	
North Shore Mat. 1st 5's[15]	5-22-29	97	.....	
Northwestern States P. C.[37]	5-17-29	152	.....	
Ohio River S. & G. 6's[16]	5-18-29	92	97	
Pac. Coast Cem. 6's, A[5]	5-16-29	92¾	96½	
Pacific Lime Co. pfd.[11]	5-17-29	60	65	
Pacific P. C. com.	5-17-29	.....	26	
Pacific P. C. pfd.	5-17-29	78	83	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	5-16-29	98¾	.....	
Peerless Egyp'n P. C. com.[1]	5-16-29	2	2½	
Peerless Egyp'n P. C. pfd.[1]	5-16-29	75	.....	
Penn-Dixie Cem. 1st 6's	5-22-29	91⅞	.....	
Penn-Dixie Cem. pfd.	5-21-29	80	83½	1.75 qu. June 15
Penn-Dixie Cem. com.	5-21-29	18½	18¾	
Penn. Glass Sand Corp. 1st 6's, 1952	5- 8-29	101	103	
Penn. Glass Sand pfd.	5- 8-29	112	.....	
Petoskey P. C.	5-21-29	10	10¾	1½% qu.
Riverside P. C. com.	4- 5-29	20	.....	
Riverside P. C. pfd.[9]	5-16-29	.....	21	1.50 qu. May 1
Riverside P. C., A[20]	5-17-29	.....	21	31¼c qu. May 1
Riverside P. C., B[44]	5-16-29	5	6½	
Sandusky Cem.	3-28-29	248	.....	$2 qu. Apr. 1
Santa Cruz P. C. bonds	5-17-29	105¾	.....	6% annual
Santa Cruz P. C. com.	5-17-29	91	.....	$1 qu. Apr. 1
Schumacher Wallboard com.	5-17-29	16	17¼	
Schumacher Wallboard pfd.	5-17-29	23½	26	
Southwestern P. C. units[44]	5-16-29	275	.....	
Standard Paving & Mat. (Can.) com.	5-20-29	.....	40	50c qu. May 15
Standard Paving & Mat. (Can.) pfd.	5-20-29	96	98	1.75 qu. May 15
Superior P. C., A[20]	5-17-29	43	44½	27½c mo. Mar. 1
Superior P. C., B[20]	5-17-29	.....	33	
Trinity P. C. units[37]	5-17-29	153	.....	
Trinity P. C. com.[37]	5-17-29	50	58	
Trinity P. C. pfd.[29]	5- 8-29	99	.....	
U. S. Gypsum com.	5-21-29	70	70½	2% qu. June 30
U. S. Gypsum pt. paid	5-21-29	56	56½	
U. S. Gypsum pfd.	5-22-29	123	124	1¾% qu. June 30
Universal G. & L. com.[3]	5-22-29	.....	1	
Universal G. & L. pfd.[3]	5-22-29	.....	10	
Universal G. & L., V.T.C.[3]	5-22-29	No market		
Universal G. & L. 1st 6's[3]	5-22-29	.....	60	
Warner Co. com.[16]	5-18-29	37	41	50c qu. Apr. 15
Warner Co. pfd.[16]	5-18-29	97	99	1¾% qu. Apr. 25
Warner Co. 1st 6's[8]	5-20-29	99	100	
Whitehall Cem. Mfg. com.[36]	5-17-29	150	.....	
Whitehall Cem. Mfg. pfd.[36]	5-17-29	98	.....	
Wisconsin L. & C. 1st 6's[35]	5-22-29	98	.....	
Wolverine P. C. com.	5-21-29	6½	6¾	15c qu. May 15
Yosemite P. C., A com.[20]	5-17-29	4¼	4¾	

*Ann. interest due May and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. †First 6½'s 1938 called for redemption at 104½, June 1.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher-Newton & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Inc., Los Angeles, Calif. [45]Taylor Ewart & Co. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 16 sh.[6]	par 25	25¾
American Brick Co. pfd., 5 sh.[2] (par 25)	25	.....
Atlantic Gypsum Products[6] com., 200 shares	$2 per share	.....
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	.....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price at auction by R. L. Day & Co., April 24, 1929. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day & Co., Boston, Mass. [6]Price obtained at auction by Wise Hobbs and Arnold, Boston, Mass.

Annual Report of Pennsylvania-Dixie Cement Corp.

THE following is from the annual report of the president of the Pennsylvania-Dixie Cement Corp., Blaine S. Smith, dated February 15: Consolidated balance sheet of this corporation and its subsidiaries, including the Pyramid Portland Cement Co. of Delaware, as of December 31, 1928, and consolidated statement of profit and loss and surplus for the year 1928 are presented herewith.

In spite of the unsettled conditions prevailing in the territories served by our plants, the year's operations resulted in net profits of $1,293,852. Regular dividends of 7% were paid on the preferred stock but no dividends were paid on common stock after the second quarter. The reduction in earnings in comparison with 1927 was largely the result of reductions in prices in the southeastern section of the country in which is located 40% of the company's productive capacity. These price reductions were made late in 1927 and therefore the full effect was not felt until the following year.

Total consumption of cement in the United States in 1928, according to government figures, was slightly ahead of the previous year, but in the Atlantic seaboard states consumption was somewhat less. Including the Pyramid plant, which was acquired during 1928, this company's own production and shipments for the year exceeded those of 1927, but the mills in the Atlantic seaboard region shipped less due to reduced consumption, to new competitive capacity which came into production in this territory and to an increase in cement imports.

Very satisfactory operating conditions have been maintained at the plants and manufacturing costs show a substantial reduction as compared with the year before. Liberal depreciation charges were made during 1928, exceeding those of the previous year, and plant improvements completed have fulfilled expectations in respect to reduced operating costs. This policy of maintaining plants in the best practicable condition and of making improvements and betterments which will reduce cost and increase efficiency will be continued, and it is expected that further substantial improvements will be made this year.

In addition to the improvements in its existing plants, the company further increased its productive capacity through the acquisition in March, 1928, of a plant of 1,200,000 bbl. annual capacity, located at Des Moines, Iowa, formerly owned by the Pyramid Portland Cement Co. This plant is comparatively new, having started operation in 1923. Owing to inadequate financing and the difficulties of operating an independent mill, the company went into receivership. This property was bought on a favorable basis, under foreclosure, in connection with which there were issued 5888 shares of 7% preferred stock of our company and over $700,000 paid in cash. Certain redemption rights under the Iowa law do not expire until March 31, 1929, after which date it is believed the property can be operated more economically and satisfactorily.

It will be noted that during the year the company met its regular sinking fund requirements, and in addition purchased $336,000 par value of its first mortgage bonds in anticiptation of its 1929 sinking fund. In spite of this heavy withdrawal for the retirement of bonds and the purchase of the Pyramid plant, the company's current ratio was more than 6 to 1 at the end of the year.

Quite generally, stockholders appreciate the injurious effect both on volume and price which imported cement is having on this and other companies serving seaboard and adjacent interior territories. The southern region has been affected to a far greater extent than the balance of our territory, the average sales realization for 1928 at the largest southern mill having declined 24 c. a barrel in comparison with 1927 and 40 c. a barrel in comparison with 1926. The effective remedy for the disorganized conditions which have caused this decline is adequate tariff protection. In the latter part of this month our case will be presented to the ways and means committee of the House, and it is hoped that at the forthcoming special session in Congress adequate and justified protection will be accorded the American cement

CONSOLIDATED BALANCE SHEET OF THE PENNSYLVANIA-DIXIE CEMENT CORP.

ASSETS

Current assets:		
Cash on hand and in banks	$ 1,573,125.62	
Notes and accounts receivable:		
Customers, less reserves	1,343,564.66	
Others	21,971.85	
Inventories of cement, work in process, raw materials and supplies, at cost or market, whichever is lower, as certified by responsible officials:		
Finished cement and process stocks	1,539,471.77	
Packages, fuel and general supplies	1,855,430.90	
		$ 6,333,564.80
Fixed assets:		
At reproduction cost, less depreciation, as appraised by Ford, Bacon and Davis, Inc., as of June 30, 1926, plus subsequent net additions at cost:		
Land, mineral reserves, buildings, machinery, equipment, etc. (including properties acquired during year 1928 subject to redemption up to April 1, 1929)	$34,613,159.83	
Less—Reserves—for depletion and depreciation	8,102,113.85	
		26,511,045.98
Miscellaneous investments		115,600.00
Insurance fund, invested in preferred stock of the corporation		35,000.00
Deferred charges to future operations		38,191.91
		$33,033,402.69

LIABILITIES

Current liabilities:		
Accounts payable	$ 332,857.27	
Accrued wages, interest, taxes, etc.	414,180.61	
Reserve for federal income taxes	283,900.64	
		$ 1,030,938.52
Reserves:		
Special reserve for property betterments and improvements, after charging losses on properties sold and dismantled	128,156.15	
Miscellaneous operating reserves	50,043.70	
		178,199.85
First mortgage sinking fund 6% gold bonds, Series A, due Sept. 15, 1941:		
Issued	$13,000,000.00	
Redeemed and cancelled	744,000.00	
	$12,256,000.00	
Less—Bonds purchased in anticipation of sinking fund	336,000.00	
		11,920,000.00
Capital stock and surplus:		
7% cumulative preferred stock:		
Authorized—200,000 shares of $100 each		
Issued—135,888 shares of $100 each (Series A convertible)	$13,588,800.00	
Common stock of no par value:		
Authorized—1,000,000 shares		
Issued—400,000 shares stated at	4,000,000.00	
Surplus as per statement attached	2,315,464.32	
		19,904,264.32
		$33,033,402.69

CONSOLIDATED STATEMENT OF PROFIT AND LOSS AND SURPLUS OF PENNSYLVANIA-DIXIE CEMENT CORP. FOR THE YEAR ENDING DECEMBER 31, 1928

Net sales		$11,838,443.08
Manufacturing cost of sales (exclusive of depreciation and depletion) and all other expenses of operating, less miscellaneous income		8,216,274.61
		$ 3,622,168.47
Deduct—Provision for depreciation and depletion		1,384,784.70
Profits from operations		$ 2,237,383.77
Deduct:		
Interest charges	$ 737,866.35	
Provision for federal income taxes	205,665.45	
		943,531.80
Net profit for the year		$ 1,293,851.97
Add:		
Surplus balance at January 1, 1928, as per last accounts	$ 2,256,700.34	
Profit on sale of New York office building	99,031.68	
		2,355,732.02
		$ 3,649,583.99
Deduct—Dividends paid:		
On preferred stock (to December 15, 1928)	$ 934,119.67	
On common stock ($1 per share)	400,000.00	
		1,334,119.67
Surplus at December 31, 1928, per balance sheet		$ 2,315,464.32

industry by a duty which will fairly equalize the difference in the cost of production and transportation.

The outlook for 1929 contains many favorable factors. Present indications are that the volume of cement shipments in 1929 will equal that of 1928. Manufacturing costs are the lowest in history and the balance sheet position is exceptionally strong. Although the company made a profit in 1928 even under the depressed conditions which prevail in many of its natural markets, a fair return on the assets of the company is dependent upon the return to normal of the disorganized markets of the seaboard and particularly the southeast. The granting of the tariff on cement will contribute materially to a constructive stabilization of these markets.

Consolidated Cement Annual Report

THE ANNUAL REPORT of the Consolidated Cement Corp., Chicago, Ill., dated May 1, 1929, signed by John L. Senior, president is as follows:

In the year 1928 the Consolidated Cement Corp. demonstrated its ability to earn profits under the unsatisfactory conditions that prevailed during this period. During the year the company showed a decrease in net sales compared with 1927 of $158,329.16; however, net earnings available for interest showed an increase of $78,723.78. This indicates that the company had less gross income than in 1927, which was offset by savings in production, selling and administrative expense to the extent that net earnings available for interest on funded debt showed a substantial increase.

During the year numerous changes were made in production methods and in equipment, and the installation of safety devices at a cost of approximately $57,000 of which $15,000 was capitalized, the balance being charged to maintenance. These changes effected savings in labor, materials, power and fuel to the extent of approximately $100,000 per annum.

Viewing the company's condition from the balance sheet at December 31, 1928, total current assets amounted to $1,579,554.33 against total current liabilities of $235,981.55, the ratio being 6.7 to one as compared with a ratio of 5.5 to one as at December 31, 1927. In the above figure of current assets $781,980.30 is represented by cash.

A summarized Profit and Loss Statement for the year is given below:

CONSOLIDATED CEMENT CORPORATION STATEMENT—1928

Net sales	$2,851,420.10
Other income (net)	20,831.67
Gross income	$2,872,251.77
Cost of cement sold, selling and administration expense (exclusive of depreciation and depletion)	*2,229,435.99
Net earnings	$ 642,815.78
Depreciation and depletion	180,921.39
Balance available for interest, amortization, federal taxes, etc.	$ 461,894.39
Annual interest requirements on $3,807,600 first mortgage 6½% bonds	$ 247,494.00
Annual interest requirements on $1,081,500 sinking fund 6½% convertible gold notes	70,297.50

*Includes $159,070.42 charged to maintenance.

On April 1, 1929, unfilled orders amounted to 379,251 bbl., an increase of 43,977 bbl. over April 1, 1928.

Prices at present in the districts served by the Consolidated Cement Corp. plants are firm.

Atlas Cement Increases Stock

THE Atlas Portland Cement Co. (New York City), stockholders have voted to approve a plan to increase authorized no-par common stock to 1,500,000 shares from present 1,000,000 shares. At the same time directors were authorized to issue the additional stock at their discretion.

It was also voted to reduce authorized preferred stock to $26,300 from present $2,500,000. Reduction is to be made by the cancellation and retirement of 74,211 shares of $33 1/3 each par value, including shares which have been surrendered for exchange for common stock or cash under plan proposed by board of directors on December 20, last, and also such preferred shares as may have been purchased by the company itself from time to time and held as treasury stock and which have been exchanged by company for common under said plan.

As of December 20, last, John R. Morron, president, notified stockholders that believing that it is for the best interest of the company to reduce its fixed charges and simplify its capital structure, which policy in the past has led to the retirement of the entire funded debt of the company, the board of directors has formulated and approved a plan for the retirement of the 75,000 shares of 8% cumulative preferred stock now outstanding. The retirement of the preferred would leave Atlas' sole outstanding capitalization 900,000 shares of common.

Under the plan the company will issue 1¼ shares of common in exchange for each share of preferred stock of $33 1/3 par. All preferred shares received by company will be cancelled and retired and will not be reissued. Insofar as the exchange would result in the issue of a number common shares exceeding the number of preferred shares surrendered and retired, such excess will be taken from common stock heretofore issued and previously purchased and now held in treasury of company, so total number of issued shares will not be increased by the exchange.

In case preferred stockholders desire to receive cash rather than to exchange their preferred for common, company will purchase their shares of preferred at $50 a share.

Retiring directors were reelected.—*New York City Post.*

COMPARATIVE CONDENSED BALANCE SHEETS

ASSETS

	Dec. 31, 1927	Dec. 31, 1928
Cash	$ 552,148.86	$ 781,980.30
Accounts and notes receivable (net)	119,582.08	92,094.76
Inventories of cement, materials and supplies	507,059.29	543,801.60
Inventories of cloth and paper sacks	173,731.21	161,677.67
Current assets	$1,352,521.44	$1,579,554.33
Prepaid expenses	33,417.91	32,920.58
Investments and other sundry assets	172,768.06	106,377.89
	1927 / 1928	
First mortgage gold bonds and cash held in suspense pending settlement of claim in dispute	$73,331.99 / $94,088.30	
Plants, properties and quarry lands—at appraised values, as determined by the American Appraisal Co., depreciated to date of acquisition plus subsequent additions at cost. Subject to reserve for depreciation per contra	6,238,555.47	6,297,645.78
Unamortized bond and note discount and expense, organization expense, etc.	440,057.02	393,492.81
Good will	1.00	1.00
	$8,237,320.90	$8,409,992.39

LIABILITIES AND NET WORTH

Accounts payable, accrued salaries, local taxes, interest, etc., and reserve for federal taxes	$ 246,459.74	$ 235,981.55
Sinking fund requirements on bonds and notes due prior to Dec. 31, 1928, and Dec. 31, 1929	$75,000.00 / $75,000.00	
Sinking fund 6½% gold notes, due March 1, 1931	1,081,500.00	1,081,500.00
First mortgage 6½% gold bonds—Series A—due March 1, 1941, less amount held by trustee for cancellation	3,884,500.00	3,807,600.00
Reserve for depreciation and depletion subsequent to date of acquirement of properties	443,999.25	615,625.40
7% cumulative preferred stock—$100 par value	1,465,400.00	1,465,400.00
No par value common stock—100,000 shares issued and outstanding—declared value	100,950.00	100,950.00
Capital surplus	851,157.72	825,257.72
Earned surplus	163,354.19	277,677.72
	$8,237,320.90	$8,409,992.39

Called for Redemption

CANADA GYPSUM AND ALABASTINE, LTD., entire issue of 20-year convertible debenture 6s, 1948, has been called for redemption on May 31 at 104¾.

Chas. Warner first and second preferred stock were called for redemption on April at 110.

Recent Dividends Announced

Atlas Portland Cement com. (quar.)	50c, June 1
Canada Cement pfd. (quar.)	1⅝%, June 29
Cleveland Quarries extra div. of 25c and reg. quar. div. of	50c, June 1
Consolidated Rock Products pfd. (quar.)	43¾c, June 1
Dolese & Shepard (quar.)	$2, July 1
Indiana Limestone pfd. (quar.)	1¾%, June 1
International Cement (quar.)	$1, June 28
Penn.-Dixie Cement pfd. (quar.)	$1.75, June 15

Portland Cement Association Makes Formal Award of Safety Trophies

Ceremony at New York Conducted by J. B. John

ON TUESDAY afternoon, May 21, at its spring meeting in the Hotel Biltmore, New York, the seventeen member mills of the Portland Cement Association which operated without a lost-time accident during 1928 received the formal award of the association safety trophy, the highest recognition a cement-mill organization may attain.

Presentation of the awards was made directly to the thirty-four delegates, two from each mill, selected by the plant organizations to receive them on behalf of the superintendent and workmen. Occupying front seats in the area reserved for representatives of the winning mills were also executives, operating officials, superintendents and safety directors of these companies.

The occasion was one of the most interesting in the history of the association. A. C. Tagge, president of the Canada Cement Co., for many years chairman of the committee on accident prevention of the association, presided. Mr. Tagge stated that at the request of President Frank H. Smith, who was unable to act because of his recent illness, J. B. John, president of the Crescent, Manitowoc, Medusa, Newaygo and Petoskey Cement companies, and present chairman of the committee on accident prevention, would make the awards.

J. B. John Makes Awards

Mr. John spoke briefly to the delegates and assembled members, praising the excellent records of the winners, giving encouragement to those who were unable to reach that point of perfection and placing a high estimate on the value of safe, intelligent workers. Mr. John said:

"We are here to express our respect and admiration for the organizations and the men in our membership who have operated a year or more without a lost-time accident. The occasion does not require oratory. The magnificent records of these mills speak for themselves.

"A year ago the Portland Cement Association trophy was awarded to ten mills, a greater number than all previous awards combined. Today it is my privilege to award 17 trophies—again a greater number than all previous awards. Three of the mills to receive this award have run over two consecutive calendar years without a lost-time accident, and one of these, the Cowell plant in California, passed the three year mark last Saturday.

"Before asking the secretary to read a brief excerpt from the record of each of these winning mills, let me say a word in appreciation of the fine work done by the 18 additional mills which suffered but one lost-time accident each during 1928 and twelve others which suffered but two such accidents during the year. We heartily congratulate all of these organizations as potential winners of the 1929 trophy. The plants having perfect records and those whose records were marred with but one or two mishaps constitute about one-third of all of the operating plants and all of them combined reported but 42 lost-time accidents, which was less than 60% as many as were suffered by the single plant which reported the greatest number of accidents.

"So many different kinds of machinery are successfully used by our members in making cement that it would be easy for us to disagree on questions relating to mechanical equipment. But no matter what process, materials or machinery we use, all of us agree on the priceless value of good men and the importance of their health, happiness and continuous ability to perform. It is, therefore, a matter of the greatest pleasure to all of us to witness the unmistakable interest of our members in this occasion.

"I will ask the secretary to read the report of the mills winning the association trophy for 1928."

The secretary then read a condensed safety record of each winning mill and declared that an inspection of the records indicated that all of the mills summoned were entitled to receive the association trophy for 1928.

Mr. John then continued:

"It is now my pleasure, acting on authority of the board of directors, and at the request of President Smith, to announce that the complete accident records of these mills have been canvassed under my direction and that all of them have been found entitled to, and are hereby awarded, the Portland Cement Association Safety Trophy for perfect safety records in 1928.

"The actual trophies, handsome blocks of tooled cast concrete, carrying the inspiring design of Safety being guided or guarded by Wisdom, have been completed and are being shipped to your respective plants to be erected and dedicated later.

"The plants which have won this award are spread out widely, representing many sections and a variety of operating conditions. They have proven that fancied handicaps due to location, process, age of plant or type of labor are not formidable obstacles where management and men decide to outlaw accidents. Your example will prove a valu-

Frank H. Smith, president, Portland Cement Association

"FIVE YEARS AGO, when the first mill to operate a full year without an accident was awarded the Portland Cement Association trophy, it was believed by many that the pinnacle of safety in the cement industry had been reached. But the years following, first 1925 with two perfect records, 1926 with two more, 1927 with a splendid ten, and then 1928 with an unprecedented total of seventeen, convinces me that our march toward the pinnacle has but begun.

"I confidently believe that the year 1929 will bring forth accident-free records by an even larger proportion of our membership and that the day is not far distant when an accident in any cement mill will be rare.

"My congratulations on behalf of the cement industry as a whole are offered each employe of the seventeen winning mills with the wish that each will again be a factor in helping his mill to repeat in 1929."

FRANK H. SMITH, President,
Portland Cement Association.
May 21, 1929.

able help to all other mills in our membership.

"As a slight personal remembrance of this occasion each delegate will now receive a platinum print of the trophy."

Winning Mills

The mills receiving the award with their delegates and other representatives present were as follows:

ALPHA PORTLAND CEMENT CO.—G. S. Brown, president; F. G. McKelvy, vice-president in charge of operations; Chas. A. Irwin, vice-president; J. H. Barbazette, manager of operations; J. F. Magee, management engineer.

Ironton, Ohio, Plant—F. C. Brownstead, superintendent, delegate; W. W. Patterson, chief engineer, delegate.

Bellevue, Mich., Plant—G. A. Lawniczak, superintendent; C. H. Denman, delegate, and H. B. Hall, delegate.

Manheim, W. Va., Plant—W. L. Matthes, superintendent; H. E. Lenker, delegate, and D. A. McVicker, delegate.

CANADA CEMENT CO., LTD.—A. C. Tagge, president; J. D. Johnson, vice-president and general manager.

Exshaw, Alberta, Plant—Gordon A. Halsey, delegate, and Roland S. Kennedy, delegate.

CONSOLIDATED CEMENT CORP.—John L. Senior, president; John L. Nelson, vice-president; J. E. Curtis, general superintendent.

Mildred, Kan., Plant—C. E. Caron (superintendent in 1928, now superintendent Florida Portland Cement Co.); E. E. Harris, delegate, and F. M. Walton, delegate.

COWELL PORTLAND CEMENT CO.—Cowell, Calif., Plant—W. J. Dermody, delegate, and W. J. Schrutrum, delegate.

LEHIGH PORTLAND CEMENT CO.—Col. E. M. Young, president; D. E. Ritter, vice-president in charge of operation; B. M. Swett, vice-president and eastern sales manager; B. H. Rader, vice-president and western sales manager; Ernest Ashton, vice-president and chief chemist; Henry A. Reninger, special representative in charge of safety work; Geo. A. Moritz, district superintendent; C. P. Benner, district safety inspector.

Bath, Penn., Plant—H. H. Heller, Sr., superintendent; E. J. Frey, delegate, and R. H. Rohr, delegate.

Foglesville, Penn., Plant—Raymond Moritz, superintendent; F. A. J. Haas, delegate, and M. O. Lehr, delegate.

Ormrod, Penn., Plant—Wm. J. Monty, superintendent; George C. Fullegar, delegate, and Benjamin F. Roth, delegate.

Sandts Eddy, Penn., Plant—James A. Gish, Jr., superintendent; Herbert Bonney, delegate, and C. S. Gaumer, delegate.

Iola, Kan., Plant—C. A. Swiggett, superintendent; Charles E. Keitzman, delegate, and James O. Myers, delegate.

MARQUETTE CEMENT MANUFACTURING CO.—R. B. Dickinson, vice-president and general manager; W. A. Wecker, secretary; Richard Moyle, Sr., general superintendent.

Cape Girardeau, Mo., Plant—Manning P. Greer, safety engineer; Raymond Ford, delegate, and H. C. Mason, delegate.

OREGON PORTLAND CEMENT Co.—Oswego, Ore., Plant—F. H. Shipley, superintendent (delegate), and J. C. Haines, delegate.

PENNSYLVANIA-DIXIE CEMENT CORP.—John A. Miller, chairman of the board; Blaine S. Smith, president; William H. Klein, general manager, southern division; Morris Fortuin, general manager, northern division; R. B. Fortuin, assistant to general manager.

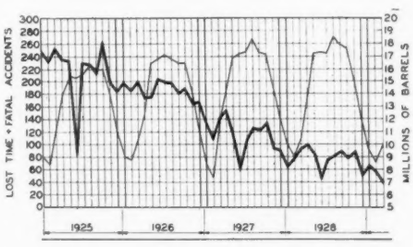
Safety trophy awarded each winning plant by the P. C. A.

Kingsport, Tenn., Plant—F. Guenther, Jr., general superintendent (delegate), and Kyle Dishmer, delegate.

STANDARD PORTLAND CEMENT CO.—Erie J. Ochs, superintendent; Andrew McAdams, delegate, and Lawrence C. Prentice, delegate.

TRINITY PORTLAND CEMENT CO.—W. H. L. McCourtie, president; Chas. E. Ulrickson, vice-president and general manager; O. V. Bartholomew, general superintendent; J. W. Ganzer, assistant superintendent and chief chemist.

Dallas, Tex., Plant—L. M. Fisher, delegate, and R. C. Youngblood, delegate.



Monthly trend comparing accident frequency with cement production

WOLVERINE PORTLAND CEMENT CO.—P. H. Sweeney, secretary and treasurer.

Quincy, Mich., Plant—John Dieterman, assistant superintendent (delegate), and P. L. Rice, delegate.

Plant Records Remarkable

Safety records made by the winning plants are built upon some of the finest department records in the industry, as will be apparent by inspection of the accompanying table. While many splendid records have been and are being made by departments of many mills which have been able to win a trophy, it is believed that the records made by various departments of the winning mills constitute a remarkable testimonial to modern cement mill efficiency.

Cement mills within the membership of the Portland Cement Association which operated during 1928 with but one accident were as follows:

Bessemer Lime & Cement Co., Bessemer, Penn.
Canada Cement Co., Ltd., Hull, Que.
Diamond Portland Cement Co., Middle Branch, Ohio.
Hercules Portland Cement Corp., Nazareth, Penn.
Lehigh Portland Cement Co., Birmingham, Ala.
Lone Star Cement Co. (Kansas), Bonner Springs, Kan.

DATES OF LAST LOST-TIME ACCIDENTS

Standing	1	2	3	4	5	6	7
Plant	Cowell, Cowell, Calif.	Lehigh, Iola, Kan.	Alpha, Ironton, O.	Consolidated, Mildred, Kan.	Alpha, Bellevue, Mich.	Penn.-Dixie, Kingsp't, Tenn.	Alpha, Manheim, W. Va.
Quarry	5–11–26	9–18–25	9–21–26	10–12–26	12– 4–25	10– 7–27	2–26–27
Clay field	.....	10– 5–20	.....	.....	.....	.....	.....
Crushing	.....	9– 9–26	11–11–24	4–25–24	1– 6–25	.....	11– 4–23
Raw	2–22–26	8– 7–22	4– 5–26	2–22–26	10–22–26	1–12–26	4–19–27
Burning	7–11–25	11–17–24	12– 8–26	11–19–26	10–11–25	1–12–26	7–19–25
Finish	4– 2–25	2–14–25	9–30–26	10–22–26	1– 6–25	12– 9–25	1– 8–26
Coal grinding	.....	11–20–25	2–25–25	9– 2–25	11– 4–24	12–28–26	4–20–25
Cement storage	7– 5–20	5–18–21	3– 9–23	9–24–25	5– 1–23	.....	12–11–25
Packing and shipping	4–10–26	.....	11– 8–26	12–14–25	11–18–26	8–26–25	8–20–27
Power	.....	8–31–20	.....	2–11–26	1– 5–25	.....	11–18–25
Shops	11–14–22	10– 8–25	8–23–21	12–13–26	7– 8–26	12–30–26	11– 1–26
Railroad (out)	8–29–22	6–18–19	.....	2–25–26	.....	5–23–27	.....
Yard	4–11–24	10–10–25	11–25–24	3–19–27	4–16–27	2–27–25	10– 1–25
Other than	4–20–25 Electrical dept.	8– 5–19	7–16–24 Dismantling	6–28–24 Plant lake	6–14–26 Construction	5–20–27 Laboratory	1–23–26 Pump house
Date of last accident in entire plant	5–11–26	9– 9–26	12– 8–26	3–19–27	4–16–27	5–23–27	8–20–27
Number of days from last accident to May 1, 1929	1085	964	874	775	745	708	619

Lone Star Cement Co. (Virginia), Norfolk, Va.
Lone Star Cement Co. (Texas), Houston, Tex.
Medusa Portland Cement Co., Toledo, Ohio.
Monarch Cement Co., Humboldt, Kan.
Nebraska Portland Cement Co., Superior, Nebr.
Pacific Portland Cement Co., San Juan Bautista, Calif.
Pennsylvania-Dixie Cement Corp., Richard City, Tenn.
Pennsylvania-Dixie Cement Corp., Portland Point, N. Y.
Pittsburgh Plate Glass Co., Zanesville, Ohio.
Superior Portland Cement, Inc., Concrete, Wash.
Universal Portland Cement Co., Duluth, Minn.
Wabash Portland Cement Co., Osborn, Ohio.

Some of the above mills lost the trophy award by a very narrow margin. The number of plants which suffered various number of accidents during 1927 and 1928 is given below as an interesting comparison.

Interesting Ceremony

After the interesting ceremony of awarding the trophies each delegate received a large platinum photograph of the handsome cast-concrete monument, the original of which, in the shape of two five-ton blocks of tooled concrete, cast and finished in various plants of the Benedict Stone Corp., will be shipped to each winning plant and erected. The following delegates replied to the address of award, accepting the trophies on behalf of all of the winning mills: Fred A. J. Haas, Lehigh; H. E. Lenker, Alpha; G. A. Halsey, Canada; Felix Guenther, Jr., Penn.-Dixie; Raymond Ford, Marquette; W. J. Dermody, Cowell. Col. E. M. Young, president of the Lehigh company, also spoke.

On Monday evening, May 19, delegates from the winning mills were guests at a dinner party and smoker at the Engineers Club, New York City, at which J. B. John, as chairman of the Committee on Accident Prevention of the Cement Association acted as host. Mr. John complimented the delegates by referring to them as representing the master cement makers of America, a select group of those who are constantly lighting the way and setting a valuable example. A. C. Tagge, a former chairman of the committee and Henry A. Reninger, president of the National Safety Council, were also present and spoke.

Safety Follows Wisdom

"SAFETY FOLLOWS WISDOM" is the thought conveyed by the symbolic design on the Portland Cement Association safety trophy awarded on Tuesday to 16 cement mills in the United States and one in Canada. Wisdom and thoughtfulness stand between the worker and danger to a much greater extent than any mechanical device. The above illustration shows the original plaster cast of the now famous placque which has become the most coveted symbol in the cement industry, as it was completed in 1923 at the Art Institute of Chicago.

"Safety Follows Wisdom" forms the center decoration of the Portland Cement Association trophy, consisting of two blocks of cut cast-stone weighing nearly 16,000 lb. A core or opening has been left between the upper and lower stones into which a bronze box is inserted with historical records of each plant.

On Thursday, May 23, the delegates all attended the regional safety meeting of the Lehigh Valley mills at the Americus Hotel, Allentown, Penn., where they were guests of honor.

Dedication Dates Being Set

Dedication and unveiling ceremonies at the seventeen cement mills which won the Portland Cement Association safety trophy for 1929 are now being arranged, according to J. B. John, chairman of the Association's Committee on Accident Prevention.

Dates for these celebrations already announced, are as follows:

Consolidated Cement Corp., Mildred, Kan., Thursday, May 30.
Alpha Portland Cement Co., Ironton, Ohio, Wednesday, June 5.
Marquette Cement Manufacturing Co., Cape Girardeau, Mo., Saturday, June 8.
Alpha Portland Cement Co., Bellevue, Mich., Wednesday, June 12.
Lehigh Portland Cement Co., Iola, Kan., Tuesday, June 18.
Cowell Portland Cement Co., Cowell, Calif., Thursday, July 4.
Trinity Portland Cement Co., Dallas, Tex., Thursday, July 4.
Alpha Portland Cement Co., Manheim, W. Va., Saturday, July 6.
Canada Cement Co., Ltd., Exshaw, Alta., Monday, July 15.
Oregon Portland Cement Co., Oswego, Ore., Wednesday, September 18.
Wolverine Portland Cement Co., Quincy, Mich., Thursday, October 10.

Biographies of Delegates from Winning Cement Mills

C. H. DENMAN and **H. B. Hall,** of the Bellevue, Mich., plant of the Alpha Portland Cement Co., delegates chosen to formally receive the Portland Cement Association safety trophy at New York, are among the most popular operating men in the Alpha organization. Mr. Denman, who is chief chemist at Bellevue, has an enviable record of 29 years in the cement industry, 24 years of which he has given to the plant where he is located at present. He has never had a lost time accident in his laboratory. H. B. Hall, Mr. Denman's associate as delegate from the Bellevue mill is a sheet-metal worker in the shops department, where he has been employed six years. Mr. Hall is an enthusiastic member of the plant inspec-

AT VARIOUS TROPHY WINNING MILLS

8	9	10	11	12	13	14	15	16	17
Lehigh, Ormrod, Penn., No. 3	Standard, Cement, Ohio	Canada, Exshaw, Alta.	Trinity, Dallas, Tex.	Lehigh, Bath, Penn.	Lehigh, Fogelsville, Penn.	Wolverine, Quincy, Mich.	Lehigh, Sandts Eddy, Penn.	Marquette, Cape Girardeau, Mo.	Oregon, Oswego, Ore.
3–16–26	.....	8–10–26	11– 1–27	.....	10– 6–27	.....	2–26–26	12–23–27	1–14–27
9–23–18	.....	.....	.....	.....	9–21–18	6–10–23	.....	6–25–26	.....
.....	7–28–27	11–21–27	7–30–23	12– 1–26	2–24–27	.....	.....	10–12–27	5–12–27
2– 9–26	9–13–27	9–22–27	9–24–27	4–16–26	10– 9–22	11–10–26	.....	8–11–26	3–23–27
8– 4–26	10– 2–27	7–12–22	4–16–27	9– 6–27	1– 3–27	.....	.....	3– 1–27	.....
8– 5–26	6–10–27	5–15–25	11–26–27	1– 4–26	3– 4–25	12–20–27	.....	10–19–24	11–25–27
11–26–24	.....	4–30–21	3–16–22	.....	10–29–23	10–27–27	3–15–26	10–27–26	.....
.....	10– 1–27	.....	.....	.....	3–25–29	.....	.....	.....	9–29–23
7–16–25	10–18–27	9–22–27	1–11–27	.....	5– 5–26	10– 3–24	.....	7– 5–27	12–27–27
6–25–23	.....	.....	4–19–24	12– 2–27	12–13–27	4–15–25	3– 9–26	10–10–24	.....
1– 6–26	.....	3–15–26	2– 2–27	.....	11–30–27	5–23–27	12–21–27	2–16–24	7–27–23
2–23–26	.....	.....	.....	.....	9–26–18	.....	.....	9– 7–25	.....
2–15–27	.....	8–18–26	7–13–27	7–15–26	10– 7–27	9–12–27	11–29–26	8–29–25	7–31–25
2– 4–25	.....	9– 5–27	7–31–26	.....	3–16–27	11–22–24	2–13–26	4–12–24	11– 1–23
Stone storage	.....	.....	Mill	.....	Coal dump	Dock	Dwellings	Storeroom	Club house
9– 8–27	10–18–27	11–21–27	11–26–27	12– 2–27	12–13–27	12-20-27	12–21–27	12–23–27	12–27–27
602	560	526	521	515	504	497	496	494	490

tion committee. There have been no lost-time accidents in his department since July, 1926.

Frank C. Brownstead, superintendent of the Ironton (Ohio) plant of the Alpha Portland Cement Co. is doubly distinguished as one of the few "supers" to lead his mill organization through more than two years without an accident, and he is also one of only five in the entire cement industry to operate an underground mine. Mr. Brownstead has been engaged in the cement industry 28 years, 26 of which have been spent at Ironton. In the vernacular, he "knows his clinker" and what's more, Mr. Brownstead has always been regarded as the good friend of every employee at Ironton.

With Mr. Brownstead at New York was **W. W. Hamilton,** plant engineer and chairman of the general safety committee at Ironton. Mr. Hamilton has been known as a confirmed safety advocate and a constant safety worker during the nine years since he joined the Ironton force. He has written a number of valuable papers on safety subjects and has just been appointed in general charge of safety work of the Alpha company, taking the place recently made vacant by the death of Russell Frame.

The third Alpha plant to win the coveted association trophy is the mill at Manheim, W. Va., represented at the New York ceremony by **H. E. Lenker,** plant engineer and **D. A. McVicker,** quarry foreman. Mr. Lenker, who is secretary of the plant safety committee has had no accidents in his department since he assumed his duties two years ago. Mr. McVicker, who has had 20 years' experience in charge at the Manheim quarry, works 55 men and has just finished 27 months since the last lost-time accident.

Canada Delegates

Canadian cement mills are represented among the 1928 trophy winners by the Canada Cement Co.'s plant at Exshaw, Alberta, which sent as its representatives to the New York meeting, **Gordon A. Halsey,** chief electrician and **Roland S. Kennedy,** shift burner. Mr. Halsey has been at Exshaw for the last four years, prior to which he was employed by the Marlboro Cement Co. at Edmonton for many years. He is one of the most interested members of the plant safety committee. Mr. Kennedy has a record of many years' safe performance at Marlbank and Calgary and has been located at Exshaw plant about 4½ years.

Cowell Delegates

W. J. Dermody and **W. J. Schutrum** of the Cowell Portland Cement Co.'s plant in Contra Costa County, California, have something on all other delegates as representatives of the only cement mill and quarry on the American continents to operate three years without loss of time through personal injury. The Cowell plant completed three safe years on May 11. Mr. Dermody, who is the machine shop foreman, has been with the Cowell company 10½ years and Mr. Schutrum, who is a plumber has been similarly employed at Cowell for about 10½ years.

Consolidated Delegates

The Consolidated Cement Corp.'s plant at Mildred, Kan., sent to New York as its trophy delegates, **E. E. Harris,** general mill foreman and **F. N. Walton,** chief electrician. Mr. Harris, whose service in the cement industry dates back 16 years, has been at Mildred seven years. He has been an active member of the mill safety committee and his own department has a record of considerably over two years without loss of time. Mr. Walton has been in the industry 11 years and at Mildred six years. He is also a member of the safety committee which put over the successful trophy campaign and has avoided accident in his own department for a period of over three years.

Lehigh Delegates

The Lehigh Portland Cement Co., winner of five trophies, sent a total of ten delegates in addition to superintendents of the winning mills and operating executives. **Elmo J. Frey,** general mill foreman, and **Roy H. Rohr,** chemist in charge of laboratory, represented the Bath (Penn.) plant. Mr. Frey has been in the cement industry 28 years, 17 years of this time at the Batch mill, having previously worked for the Dexter, Nazareth, Phoenix and Atlas companies. Since 1925 he has occupied his present position as general mill foreman and chairman of the factory inspection committee. Mr. Rohr is chairman of the first-aid committee. He has been employed at Bath during the last 12 years and has been in charge of the laboratory since April, 1928.

Fred A. J. Haas, delegate from the Lehigh mill at Foglesville, Penn., is assistant secretary of the mill safety committee. He occupies the position of storekeeper and in his 19 years experience at Foglesville plant has never had a lost-time accident. **Martin C. Lehr,** also delegate from Foglesville is general mill foreman and vice-chairman of the mill safety committee. Mr. Lehr entered the industry 23 years ago and has been employed at Foglesville continuously since.

The Iola (Kan.), mill of the Lehigh sent as delegates **Charles E. Kietzman** and **James O. Myers.** Mr. Kietzman, who is chief electrician, has had no lost-time accident in his department since November, 1925. He has been employed at Iola seven years. Mr. Myers has just completed a quarter of a century as machinist in the cement industry, 11 years of that time at the Iola mill. At present he is foreman of machine shops and member of the mill safety committee. The last lost-time accident in his department occurred in May, 1925.

Mill "F" of the Lehigh organization had the distinction of sending to the meeting the two delegates of long service. **George C. Fullagar,** chief storekeeper and secretary of the mill safety committee since 1918 has been employed in the industry for 30 years, all of this time with the Lehigh company at Ormrod. **Benjamin F. Roth,** also a delegate from Ormrod is Mr. Fullagar's senior in the industry by one year, having entered the employ of Lehigh in March, 1898. Mr. Roth is general mill foreman. He has been employed at Ormrod 26 years and has been a member of the mill safety committee since 1914.

Herbert Bonney, machine shop foreman and **C. S. Gaumer,** chief clerk, represented Sandt's Eddy (Penn.) plant as delegates. Mr. Bonney has been at Sandt's Eddy 3½ years and in addition to acting on the general safety committee he is chairman of the workmen's committee. Mr. Gaumer, who is secretary of the general safety committee, has been with the Lehigh Portland Cement Co. 21 years and with the Sandt's Eddy plant a little more than 3½ years.

Marquette Delegates

Raymond Ford and **H. C. Mason** of the Cape Girardeau (Mo.) plant of the Marquette Cement Manufacturing Co. represented this organization as delegates. Mr. Ford, who has been employed at Cape Girardeau since December, 1923, is quarry blacksmith and chief of the quarry safety police. More than five years has elapsed since the last accident in the quarry shop. Mr. Mason is a miller in the finishing department having joined the Cape Girardeau organization June 25, 1924. No lost-time accident has occurred in his department since the records were established in January, 1924.

Oregon Delegates

The Oregon Portland Cement Co.'s plant at Oswego, Ore., a suburb of Portland, captured the distinction of being the second mill west of the Rockies to win the Association trophy. **H. R. Shipley,** superintendent, and **J. C. Haines,** packing foreman, were sent as delegates. Mr. Shipley, who has been at Oswego since the mill commenced operating 14 years ago, is chairman of the general safety committee. Mr. Haines has been at Oswego 11 years and is a member of the plant safety committee.

Penn-Dixie Delegates

The Pennsylvania Dixie Cement Corp.'s

plant at Kingsport, Tenn., was represented at the meeting by Felix Guenther, Jr., general superintendent and Kyle Dishner, foreman of shops. Mr. Guenther has seen more service in the industry than any other delegate, having a record of over 31 years, the last third of that period at Kingsport. He is chairman of the plant safety committee. Mr. Dishner has a record of 17 years' service in the industry and at Kingsport and has been able to operate the shops department without a lost-time accident since August, 1925.

Standard Delegates

Andrew McAdams, foreman of the clay slurry department and **Lawrence C. Prentice,** master mechanic, were chosen to represent the mill of the Standard Portland Cement Co., Painesville, Ohio. Mr. McAdams, who has been at the mill 2½ years is in direct charge of safety work, while Mr. Prentice who went to Painesville 3½ years ago, is a member of the general safety committee.

Trinity Delegates

Louis M. Fisher and **Richard C. Youngblood** were chosen to represent the Dallas plant of the Trinity Portland Cement Co. as delegates. Mr. Fisher is quarry foreman and a member of the plant safety committee. He has been with the Trinity company at Dallas for 20 years. Mr. Youngblood is head kiln burner at Dallas and a member of the general safety committee. He has been employed in the industry for 27 years and for the Trinity company at Dallas 18 years.

Wolverine Delegates

The Quincy, Mich., plant of the Wolverine Portland Cement Co. was represented by **John Dieterman,** assistant superintendent in charge of the Quincy mill and **B. L. Rice,** mill foreman. Mr. Dieterman entered the cement industry 27 years ago from the flour mills, and for the last 25 years has been with the Wolverine company at Quincy. He is chairman of the mill safety committee. Mr. Rice has been employed at the Quincy mill for 20 years.

Safety Main Objective During June

P. C. A. Starts Biggest Campaign

JUNE OF EACH YEAR is set aside by the cement mills of America as a period during which to measure how nearly the entire industry can come to operating without accidental injury to its entire working force.

Symbols of safety to fly on all member mills of the P. C. A. during June

In 1925, 1927 and 1928 special June safety efforts resulted in surprising reductions; in 1928, when similar efforts were not made, June accidents mounted higher than during any other month of that year.

Program Interesting

The program being followed as a preliminary to the June drive on accidents is interesting. The more important features are as follows:

(1) Every cement company executive, operating manager, superintendent, foreman and workman throughout the industry is signing an enrollment or pledge to aid the campaign to the extent of his ability and to work during June without accident.

(2) Plant safety committees are meeting at intervals of a few days during May to perfect arrangements for safety features to be introduced during June.

(3) The flag designated to fly from plant flag poles from June 1 until a lost time accident occurs will be dedicated and displayed for the first time at 3 o'clock Saturday afternoon May 11, at the seventeen mills which operated without accident during 1928. The new flag will be raised with appropriate ceremonies, below the national flag and will fly at these plants until sundown of that day.

The form prescribed for the dedication of the special flag, used every year for this is as follows:

"Forty thousand men, working in the wide-flung reaches of the portland cement industry will work under the flag we are raising today. They will guard it—not by acts of carelessness, but by a carfeul, thinking effort. They will cherish it as a symbol of safety, they will guard it well for it means the happiness of their loved ones as well as themselves.

"There is no substitute for a careful man. And as the safety banner unfurls to the breeze may we not pledge added efforts for the safety of our comrades and may we not look forward to a day when accidents shall be banished from our plants. Safety follows wisdom—let us take a sacred pledge to do our part in working safely not only during June but as long as we are privileged to continue in our industry.

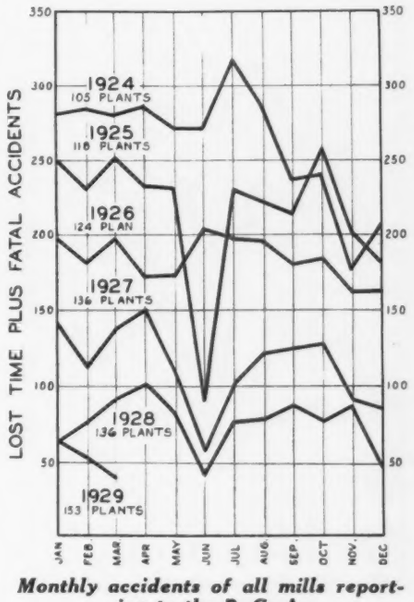
"We dedicate this safety banner with the admonition to every worker in every plant: 'Keep the safety flag flying, it means prosperity, health and happiness to all of us.'

"We consecrate this banner to the most beneficient struggle of the age—the fight against accidents."

(4) On May 30 and 31 over 150 mass meetings of the mill organization will be held throughout the association membership, with special speakers and music. The objects and methods of the campaign will be explained to every workman and each will sign the green pledge cards provided by the association for all operating men.

(5) Every foreman and department head will thoroughly inspect his men as well as the premises and equipment of his department and after making sure that everything is in readiness, he will sign and send to his superintendent a report indicating that his department is ready to proceed with the campaign.

(6) Signifying the actual opening of the campaign, the official flag will be raised at



Monthly accidents of all mills reporting to the P. C. A.

all mills within the membership of the Portland Cement Association at sunrise June 1. The flag will remain flying, day and night, until a lost-time accident occurs, when it must be hauled down and a report sent to the association describing the accident which brought it down. From sunrise to sunset the safety flag will fly below the national standard and from sundown to sunrise it will fly at the mast-head alone, illuminated with spotlights.

Foreman's Pledge

The foreman's enrollment and pledge reads as follows:

..... Department
..... Mill
..... Company

"The above department, of which I am in charge, hereby enrolls for the June No-Accident Campaign and will make every possible effort to operate without accident during the course of the campaign and as long thereafter as possible.

"You can depend on me to read all instructions carefully and to make all of my men familiar with the objects and activities planned in connection with the campaign.

"I promise faithfully to ascertain and give assurance to my superintendent that all employes of my department are in good health, in full possession of mental and physical faculties and capable of completing their usual duties during June without an accident. In cases where employes of my department are not considered safe men with which to enter this campaign, I promise to take up each case with our superintendent and exert my best efforts to eliminate the hazards involved.

"I also promise to conduct a general inspection and 'clean-up of my department during the week of May 27-June 1, thoroughly covering all of the following items:

General premises and buildings used by my department.
Walks, passageways, stairs, handrails, doors, windows and openings.
Machinery of all kinds and power apparatus.
Conveyors, cables, chains and transmission.
Railroad, craneways, elevators, automobiles and trucks.
Tools and portable equipment.
Material—raw and finished, in process or in storage.
Waste material and objects in storage or not in use.
Supplies and supply storage, including explosives magazines.
Wash rooms, lockers and employes personal property.
Protective apparatus, including fire and blasting alarms.
Goggles, safety shoes, insulators, switch locks, emergency stops.
First aid apparatus and facilities.

"The above inspection will be faithfully repeated daily during the month of June either by myself or by an assistant for whose intelligence and thoroughness I am willing to vouch.

"It is my belief that my department, by exerting all possible watchfulness and avoiding all unnecessary hazards, will be able to operate throughout June without a lost-time accident."

Individual Work During June

The Portland Cement Association has purposely left detailed plans for accident-free operation of the various mills during June entirely to the mill safety organizations. It is hoped in that way to help develop initiative and provide opportunity for local talent. Every possible help is given to the mills in preparing them in advance to demonstrate performance throughout June but when the first of that month arrives, every mill is required to do its own thinking and to take its own precautions without any outside help.

If the record of recent months is any guide, the accident list in the cement mills is due for a sizable tumble if not complete elimination during June 1929.

Active preparations for this June campaign was really started in January and by February 1 over 100 mills had entered a program of first-aid training conducted by the United States Bureau of Mines as a preparatory activity. On May 1, 160 mills had enrolled for the June campaign.

LAWRENCE PORTLAND CEMENT COMPANY
INCORPORATED
302 BROADWAY, NEW YORK, N.Y.

GENERAL OFFICE
NORTHAMPTON, PENNA.
MILLS
SIEGFRIED, PENNA.
THOMASTON, MAINE

Committee on Accident Prevention and Insurance,
Portland Cement Association,
33 West Grand Avenue,
Chicago, Ill.

Gentlemen:

THE FULFILLMENT OF ANY AGREEMENT HEREIN EXPRESSED MUST BE CONTINGENT UPON STRIKES, ACCIDENTS, DELAYS OF CARRIERS AND OTHER DELAYS BEYOND OUR CONTROL, AND QUOTATIONS NOT LIMITED BY DATE OF OPTION, MAY BE REVISED BY US WITHOUT NOTICE

This company enrolls eagerly in the campaign to operate the cement industry during June 1929 without a lost time accident. This year our men feel better prepared than ever to make our June record an outstanding example of industrial efficiency.

We are appealing to every man in our employ to aid in this campaign, particularly for the benefit of his family and himself. With the cooperation of every employee, failure is unthinkable.

Our organization is going into this campaign to win!

Yours truly,

FRANK H. SMITH
PRESIDENT

DRAGON PORTLAND CEMENT
DRAGON SUPER HIGH
DRAGON MASONRY

Letter committing the mills of the president of the P. C. A. to the June campaign

PLEASE SIGN AND
RETURN PROMPTLY TO
PORTLAND CEMENT ASSN.
33 WEST GRAND AVENUE
CHICAGO

MILL ENROLLMENT

JUNE NO-ACCIDENT CAMPAIGN - 1929

PORTLAND CEMENT ASSOCIATION

Fredonia Mill Consolidated Company

Our mill organization hereby enrolls in the June No-Accident Campaign for 1929. From past experience we have no hesitancy in giving the assurance that all of our departments, down to the last man, are ready to lend their support and are confident that we can succeed.

Our workmen as well as our management are fully determined to eliminate accidents and welcome the opportunity to help make June a real no-accident month throughout the entire cement industry.

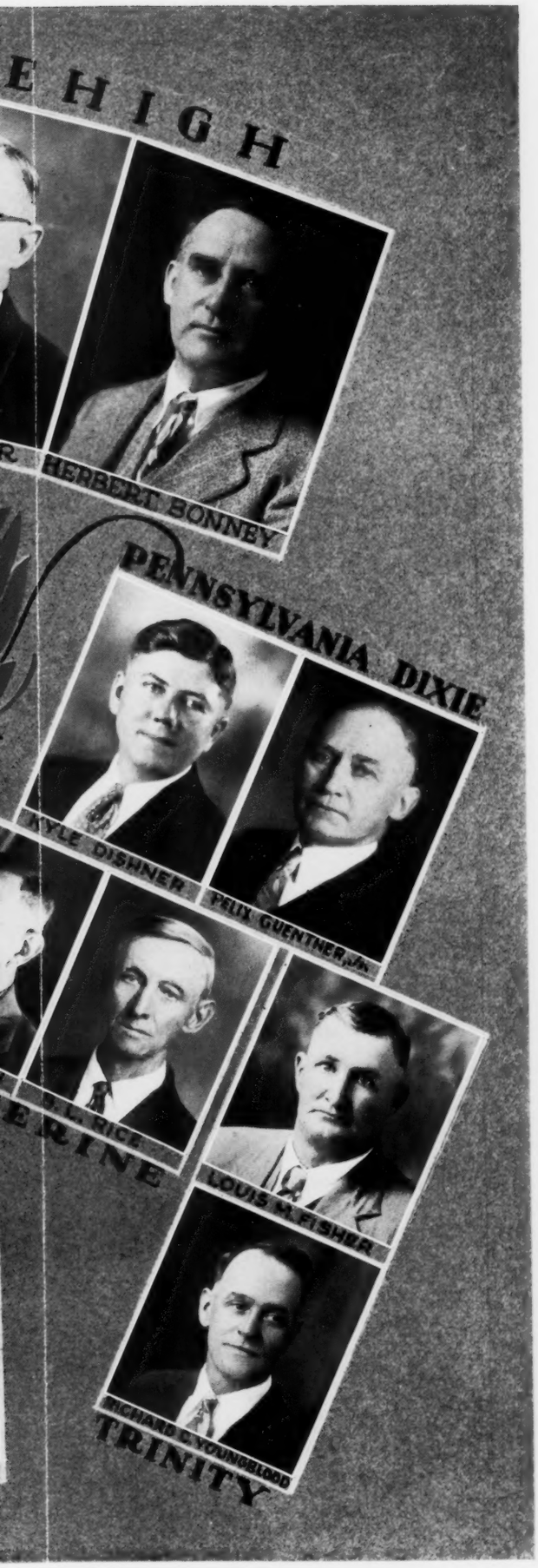
J W Palmer
(Signed)

Date April 24-29 Supt
(Title)

Sample of form used to enroll each mill in the P. C. A. June campaign

LEHIGH
FRED. A. J. HAAS
MARTIN O. LEHR
LEHIGH
E. J. FREY
R. H. ROHR
LEHIGH
CHAS. E. KIETZMAN
JAMES O. MEYER
OREGON
H. R. SHIPLEY
J. C. HARRIS
CONSOLIDATED
E. E. HARRIS
FLOYD N. WALTON
DELE
1928 SAFETY TROP
Portland Cemen
COWELL
GORDON A. HALSEY
W. J. SCHUTRUM
W. J. DERMODY
A L P
CANADA
ROLAND S. KENNEDY
H. B. HALL
C. H. DENMAN
F. C. BROWNSTEAD

ent to Rock Products, May 25, 1929


E HIGH
HERBERT BONNEY
PENNSYLVANIA DIXIE
KYLE DISHNER
FELIX GUENTNER, Jr.
ERINE
LOUIS M. FISHER
RICHARD C. YOUNGBLOOD
TRINITY

Sand and Gravel Convention to Go to Memphis in 1930

Directors of National Association Meeting at Toronto Endorse Rock Products Safety Competition—Favor Adoption of Code of Trade Practices

THE ANNUAL SPRING MEETING of the board of directors of the National Sand and Gravel Association was held in Toronto, Ont., May 16 and 17. The meeting was well attended, and the Canadian producers in Toronto, headed by President Hardy of the Consolidated Sand and Gravel Co., Ltd., proved admirable hosts at a dinner party on May 16, as well as throughout the sessions of the board.

Memphis Next Convention City

The directors voted unanimously to hold the next annual convention of the association at the Peabody hotel, Memphis, Tenn., Monday to Wednesday, January 27, 28 and 29, 1930. This is about three weeks later in the month than the conventions have been held for the past few years. W. W. Fischer, president of the Fischer Lime and Cement Co. and affiliated organizations, Memphis, will be general chairman of the committee on convention arrangements.

The Southern Sand and Gravel Association was recently formed at Memphis with Mr. Fischer as president, and it is expected that unusual steps will be taken to make the first national convention of the industry at Memphis a huge success.

Committee on Trade Practices Appointed

The board of directors voted unanimously as to the desirability of the sand and gravel industry conducting a trade practice conference for the purpose of eliminating unethical and unfair business practices, in cooperation with the Federal Trade Commission. The following trade practice code committee was appointed: Hugh Haddow, Jr., Millville, N. J., chairman; V. O. Johnston, Oberlin, Ohio; John Prince, Kansas City, Mo., and H. S. Davison, Pittsburgh, Penn.

Other subjects discussed at the meeting were: The financial affairs of the association; the cost of cleaning and repairing railway cars; unfair sales policies of machinery manufacturers—extension of long-term credits to prospective producers, etc.—which are contributing in numerous instances to overproduction; the proposed safety contest in the sand and gravel industry, for a trophy to be given annually by ROCK PRODUCTS, which was unanimously endorsed; a standard depreciation scale for the industry; compensation insurance rates in marine sand and gravel operations; the *National Sand and Gravel Bulletin;* the progress of the research laboratory and a discussion of tests involving sand and gravel now being conducted by other organizations; simplification of commercial sizes of sand and gravel. How this latter objective could be accomplished with the help of the United States government was explained in considerable detail by Mr. Lockwood, of the Simplified Practice Division of the U. S. Department of Commerce.

The financial report of the secretary showed a healthy growth in the resources of the association. The estimated income for the year March 1, 1929, to March 1, 1930, is about $68,000, of which about $47,000 is from membership dues of active and associate members.

Secretary's Report

Extracts from the report of V. P. Ahearn, executive secretary, as follows, give an excellent summary of some high points of the subjects under discussion at this time:

"The trade practice conference affords, broadly stated, a means through which representatives of an industry voluntarily assemble, either at their own instance or that of the Federal Trade Commission, but under auspices of the latter, for the purpose of considering any unfair practices in their industry, and collectively agreeing upon and providing for their abandonment in cooperation with the commission. It is a procedure whereby business or industry may take the initiative and make its own rules of business conduct—its own law merchant, subject, of course, to sanction or acceptance by the commission.

"The procedure deals with an industry as a unit. It is concerned solely with practices and methods, not with individual offenders. It regards the industry as occupying a position comparable to that of 'friend of the court' and not as that of the accused. It wipes out on a given date all unfair methods condemned at the conference and thus places all competitors on an equally fair competitive basis. It performs the same function as a formal complaint without bringing charges, prosecuting trials or employing any compulsory process, but multiplies results by as many times as there are members of the industry, who formerly practiced the methods condemned and voluntarily abandoned. Mere attendance at a conference, or actual participation in the deliberations, is not taken as an indication that any firm or individual thus participating has indulged in the practices condemned at such conference.

"As the procedure and its benefits have become better understood, it has grown rapidly in favor with business and industry, and the commission, in April, 1926, established a 'Division of Trade Practice Conferences,' to coordinate and expedite the work, enlarge the scope of the conferences, provide for proper action in case of any alleged violation of the conference rules and promote closer cooperation between business as a whole and the commission in serving the public.

"The procedure is as follows: When a trade practice conference is applied for, a preliminary inquiry is made by the Division of Trade Practice Conferences, the result of which serves as a basis for determining whether the practices or methods used are unfair to competitors or against the public interest, and whether the interest of the public is best served by calling a trade practice conference for the industry in question. The commission is then advised regarding the facts and the law, accompanied by a recommendation as to the action to be taken with reference thereto. If the commission determines on a trade practice conference, the industry is assembled at a specified place and time.

"Such a conference may be called on the application of a representative group in an industry, or by the commission on its own initiative. In either case the consensus of opinion of the entire industry is sought, and if a desire for such a conference is shown on the part of a sufficiently representative number, the entire industry is invited to participate. A commissioner of the Federal Trade Commission presides, but in order to give the widest possible range to the discussion of any practices which may be proposed, and to preserve the voluntary character of the conference, those present are encouraged to organize by electing their own chairman and their own secretary. The representatives of the commission then withdraw.

"After the industry has frankly examined and freely discussed any practice or method, the elimination of which would be beneficial and fair to all in the industry and to the public, resolutions are framed which, in the judgment of its representatives, are workable and enforceable. The presiding com-

missioner is then notified, and the resolutions are separately voted on and further discussed, if desired. The proceedings of the conference are then reported to the commission through the Division of Trade Practice Conferences, and, after consideration, such resolutions as are accepted and approved by the commission become the rules of business conduct for that industry on the subjects covered. The remaining resolutions, if any, are taken as advisory, or should any be considered as against the public interest, they would be rejected.

"The procedure is predicated on the theory that the primary interest of the commission is the interest of the public. The public is entitled to the benefits which flow from competition, and each competitor is entitled to fair competition. The legitimate interests of business are in perfect harmony with the true interest of the public. That which injures one undoubtedly injures the other, and the commission, in the creation of the trade practice conference procedure, provides a medium through which, in appropriate situations, the interests of both may be mutually protected in matters of competitive practices. It also offers, in the conferences, a common ground upon which competitors can meet, lay aside personal charges, jealousies and misunderstandings, freely discuss practices of an unfair or harmful nature, or otherwise not in the public interest, reach a basis for mutual understanding and confidence, and provide for the abandonment of such practices into which they often drift unwillingly and without wrongful intent, to the mutual advantage of all and to the protection of the public.

"The economy effected, the co-operation established by voluntary action, and the wiping out at one time from an industry of practices which the industry considers bad, has commended the trade practice conference procedure to both industry and the public. Studies of the Chamber of Commerce of the United States, incorporated in a report on trade relations, demonstrated that a great variety of unethical practices or trade abuses exist in dealings between members of an industry which, although many in number and widely different in character, are to be attributed largely to a state of distrust and misunderstanding between the parties concerned. In other words, certain well-known unethical business methods are pursued by one member of an industry because he suspects that his competitor is doing the same thing. If they could be brought together by an impartial agency, agree that each would cease the unfair practice in consideration of the other party binding himself likewise, the industry would be purged of an evil which might well destroy it in time. Although there can be no true approximation of the cost to an industry and to the public of unfair business conduct, it must amount to a stupendous sum annually.

"The beneficial results to business of elimination of unfair trade practices may be imagined if the time and money spent by parties in attempting to secure unfair advantages against one another were devoted to co-operative thought and effort to improve trade relations, each element in industry recognizing that it can best further its own prosperity by helping to build the prosperity of the business with which it deals. A state of warfare may bring temporary advantage to one side or another, but individual gains are equalized in the course of time and all industry finally bears the burden of strife.

"Certain objections are usually offered to this form of co-operative effort. It is suggested, in the first place, that this is equivalent to an invitation for government to meddle in private business. Instead of bringing the government into private business, the effect of a trade practice conference is to keep the government out of business. By this means an industry may set up its own standards of conduct, which, if they serve adequately to protect the public interest, will remove all occasion for governmental intervention.

"No additional authority is conferred upon the Federal Trade Commission by a trade practice conference. Anything that the commission can do after a conference it could have done equally well and with the same effect if the conference had not taken place. The jurisdiction of the commission extends to preventing unfair methods of competition, and this it derives from the organic act.

Financial Affairs of Association

"Since January 1 there have been several additions to the membership list of the association. They total 18 producers located in the states of Massachusetts, Ohio, Oklahoma, West Virginia and Wisconsin.

"The new scale of dues established by the board of directors at the meeting in Cleveland apparently has met with the favor of the membership. While there have been three resignations, none of these was attributed to objection to the higher cost of membership in the association.

"In addition to the number of new members previously referred to, there are excellent prospects that more will be added in the immediate future as a result of field efforts by Mr. Walker and the executive secretary. It has been necessary for both of us to spend a great deal of time out of the office since the first of the year, for the purpose of attending conventions and state district associations, and in local membership work.

"The 1928 convention of the association was a financial success. After deducting expenses which could in any way be attributed to the cost of our annual meeting, including traveling expenses of the staff of the Washington office, a net income of $2557.88 is shown by the convention report. The machinery exhibition, now a regular feature of the annual gatherings, is undoubtedly responsible for stimulating a larger attendance and for enabling the association to conduct the meeting without expense. For instance, it is interesting to know that at the convention of the association in Atlanta, the last without an exhibit, the organization incurred an expense of $2233.14 which had to be met out of income from dues.

Cost of Cleaning and Repairing Railroad Cars

"As the board is already informed, the committee appointed to investigate the expense involved in cleaning and repairing railroad cars has completed its report. It would seem that the sand and gravel industry is spending approximately $1,500,000 annually in conditioning cars for loading, an expense which it should not be called upon to assume. Unfortunately, there is no remedy in the law for reimbursement of the producers by the railroads.

"It was considered advisable in conducting this activity to enlist the co-operation of the National Crushed Stone Association and the National Slag Association in carrying our case to the American Railway Association. Such co-operation was extended and each of the two industries in question has made suitable investigations. The joint reports will be submitted to the railroad authorities at a conference in Washington on June 5, at which time it is expected that measures will be taken for bringing some measure of relief to the producers of aggregates in the matter of car expense.

Unfair Sales Policies of Machinery Manufacturers

"At the last meeting of the executive committee, consideration was given to complaints received from several members to the effect that many manufacturers and distributors of machinery and equipment used in the sand and gravel industry were selling their products under credit terms which include small, if any, down payments, accompanied by an allowance for the payment of balances extending over periods of many months.

"The executive staff of the association was requested to make suitable investigations for the purpose of determining the extent of the practices referred to in order that action might be taken by the association looking toward the elimination of any evils which were found to exist. On March 21 a circular letter was addressed to the membership on the matter, and with the letter was enclosed a questionnaire as a means of suggesting the kind of information which the association needed. The responses to this letter indicated that a condition exists which should be corrected, and while this seems to be particularly true with reference to credit policies of motor truck manufacturers, it was reported in several cases that some manufacturers of other types of equipment are

equally as responsible for bringing about overproduction in the sand and gravel industry in several localities.

"It is only through the instrumentalities of the national association that any effective action can be taken to improve the situation of which complaint is made, but before we can handle the matter intelligently with the manufacturers, we should have more information than is now available. We have asked those who have not answered to reply to the questionnaire. The matter should be considered at this meeting of the board and a definite program adopted concerning the course of procedure which the association should follow.

Safety Contest in Sand and Gravel Industry

"ROCK PRODUCTS has offered to present a prize of $250, in the form of a cup or other appropriate emblem, to that member of the association having the best no-accident record in any one year, in a contest to be supervised by the U. S. Bureau of Mines. The offer was accepted by the executive committee.

"All details of the contest have been announced through the *Bulletin Supplement* and *The Bulletin*. The membership has received full information regarding the rules of the contest and has been supplied with the necessary forms for entering the contest and for the reporting of accidents.

"The sand and gravel industry stands practically alone in its failure up to this time to interest itself in safety work. The magnitude of our business demands that we have definite information regarding the amount of accidents in our operations, for such information is needed for many purposes. It is recommended that the board record, by resolution or otherwise, its full approval of the contest, and urge the membership to extend their full co-operation in making it a success.

Standard Depreciation Scale for Sand and Gravel Industry

"The depreciation committee of the association, during the course of the last two years, has been making an exhaustive study of depreciation experiences in the sand and gravel industry at the request of the U. S. Bureau of Internal Revenue. The membership has been informed from time to time of the progress of the investigations, through appropriate notices in *The Bulletin* and in the *Bulletin Supplement*.

"It was considered necessary at the outset of the investigation to divide the sand and gravel industry into four different kinds of operations: first, marine operations; second, pumping operations; third, bank operations, and, fourth, rock products operations in Southern California. Sub-committees, composed of representative producers in each type of operation, were appointed to assist the main committee in completing its work.

"The preliminary work of the committee has been completed and copies of the reports of the sub-committees have been submitted to the membership for criticism. When time has been afforded for every member company to reply, all appropriate changes will be incorporated in the report of the depreciation committee before the matter is taken up with the Treasury Department.

"The Commissioner of Internal Revenue has advised the association of a change in policy affecting the depreciation studies which they have been making in all major lines of industry in the country. The fear has been expressed in some quarters that it would be necessary, following the submission of recommendations of our depreciation committee and the committees of other trade associations, to enter into an agreement with the commissioner which would make our recommendations binding upon the members of the industry, unless such substantial discrepancies later became apparent as to warrant the reopening of the entire subject.

"The Commissioner of Internal Revenue has now advised us that they will not require the entering into of such an agreement as this, but will accept the reports of our depreciation committee for use in the preparation of a bulletin shortly to be published by the Treasury Department. This bulletin will also include official suggestions by the government concerning approved accounting procedure, as well as the percentage rates of depreciation applicable to the various assets.

"It is thus apparent that additional advantages will accrue from the work of our depreciation committee, and we wish to place our final recommendations before the Commissioner of Internal Revenue at the earliest practicable date. While a great deal of correspondence has been had with the membership on the question, and while members of each of the committees have made careful investigations before undertaking to recommend average depreciation experiences in the sand and gravel industry, it was considered advisable, before submitting any figures to the Commissioner of Internal Revenue, to give the membership an opportunity for final comment on the proposed reports.

"Depreciation for income tax purposes is defined as the gradual exhaustion of the usefulness of property employed in the trade or business of the taxpayer, such exhaustion comprising wear and tear, decay or decline from natural causes, and various forms of obsolescence such as are attributable to the normal progress of the art, inadequacy to the growing needs of business, and the necessity of replacement by new inventions.

Compensation Insurance in Marine Sand and Gravel Operations

"The committee appointed to handle this matter will have a meeting during the present session of the board. As a means of understanding what they are endeavoring to accomplish, it should be stated that under present court rulings, marine producers have to assume risks under three separate and distinct laws: state compensation for forces working entirely on shore; federal longshoremen's insurance for employes working between shore and water, assisting in unloading barges; and a third liability under the Admiralty Act for all employes working on floating property.

"The committee hopes to be able, through securing necessary legislative changes, to concentrate the compensation insurance liability of marine producers in a single policy.

National Sand and Gravel Bulletin

"It is gratifying to be able to report that *The Bulletin* is still showing an income in excess of the cost of printing and mailing. Up to May 1 of this year, the records show that our income from advertising and subscriptions amounted to $3738.84, while the total expenditure was $2586.28, with a resultant profit of $1152.56, or an average monthly profit of $96.05.

"In accordance with authorization of the executive committee, *The Bulletin*, effective with the July issue, will be changed to a size of 9x12 in."

Large Group of Chicago Building Material Dealers Reported in Merger

THE CONSOLIDATION of a large group of building material concerns of Chicago into one large corporation designed to put an end to unprofitable operations in the industry and with the Consumers company as the nucleus is in the making, according to the *Chicago* (Ill.) *Tribune*.

Initial steps toward the consolidation were taken when Andrew C. O' Loughlin, president of the Central Lime and Cement Co. and head of the A. C. O'Loughlin Co., producers of crushed stone, took complete charge of the building material department of the Consumers company with the title of general manager of the department.

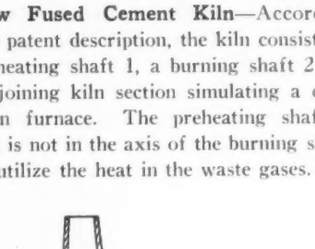
The Consumers company handles all types of building material and lumber as well as being the largest retailer of coal and ice in the Chicago district. The Central Lime and Cement Co. operates gravel pits and distributing yards and the O'Loughlin company's quarries are located in the Chicago district.

It is understood that these companies will continue to operate separately until a more advantageous time arrives for a more closely knit physical consolidation and the distribution of new securities to finance the deal along with the exchange of present outstanding obligations.

When the merger is completed one of the first things to be undertaken will be the elimination of unproductive properties. The plan will be to keep productive yards at all strategic points in the Chicago metropolitan district. Each yard will operate in its own sector.

Foreign Abstracts and Patent Review

New Fused Cement Kiln—According to the patent description, the kiln consists of a preheating shaft 1, a burning shaft 2 and an adjoining kiln section simulating a combustion furnace. The preheating shaft 1, which is not in the axis of the burning shaft, is to utilize the heat in the waste gases. The



Shaft kiln for fused cement

floor 10 thus formed has such a slight inclination that the mix in the shaft cannot slide into the burning shaft without applying exterior force, which is done by hand through opening 3 or by an automatic control operating by way of the opening 5.—German patent applied for. *Zement* (1928), **17,** 51, p. 1824.

Characteristics of Stucco Gypsum—According to Schoch's book, "Die Moertelbindestoffe, Zement, Kalk, Gypsum," the hemi-hydrate, $2(CaSO_4)$ plus H_2O (usually written in American literature $CaSO_4 \frac{1}{2}H_2O$) is 93.8% $CaSO_4$ plus 6.2% H_2O. It is usually designated as stucco gypsum, and has at 25 deg. C. (77 deg. F.) a specific weight of 2.75 (van't Hoff). The theoretical heat consumption for changing 1 kg. (2.2 lb.) of double hydrate into hemi-hydrate amounts to 138 W. E. (552 B.t.u.). Its solubility is about 10.5 gram per liter at 25 deg. C. (77 deg. F.). Le Chatelier based its quick set upon the increased solubility in water of the hemi-hydrate as compared to the double hydrate, for if a ground hemi-hydrate is sprayed into 60 to 70 weight parts of water of 63.5 deg. C. (146 deg. F), a portion of it is dissolved, but changed at once into the double hydrate under absorption of water and release of heat, leading to an over-saturated, double-hydrate solution, from which the excess secretes at once as fine crystal needles, which continues until all hemi-hydrate is changed into double hydrate, so that the setting of the stucco gypsum is to be considered as an intermatting and intergrowing of the secreting crystals of the double hydrate. The strength and hardness of the set gypsum depends therefore not only upon a correct burning of the hemi-hydrate, but also upon the volume of makeup water and the period of setting, and the slower it sets under use of the correct percentage of water, the stronger grow the crystals and the more solid and sturdy is the cast. The differences in hardness of the raw gypsum rock would hardly have an influence upon the strength and hardness of the set gypsum. Setting is quickened and the strength increased if the gypsum grains of the hemi-hydrate are small, thus offering more surface to the action of the water (see test results, Rock Products, 1928, No. 19). A rapid-setting gypsum is obtained by grinding it after the burn, since a portion of it is frequently unavoidably heated above 180 to 200 deg. C. (356 to 392 deg. F.) and thus sintered on the surface, so that it is more solid and slow setting unless ground. Normal stucco gypsum, if mixed with the correct volume of water, remains pourable for 2 to 4 minutes and plastic for 8 to 10 minutes. On the average, its tensile strength is 10 to 12 kg. per sq. cm. (142 to 171 lb. per sq. in.) after 24 hours, and 20 to 26 kg. per sq. cm. (284 to 370 lb. per sq. in.) after 28 days. Finely ground gypsum leaves a residue of 0 to 10%, medium fine of 10 to 20% and coarse of 20 to 38% upon the 900-mesh (75-mesh) screen. Depending on the grind, the volume weight is 650 to 850 grams per liter if poured in loosely, and 1250 to 1400 grams if mixed in solidly. Setting of gypsum may be retarded by adding lime water, borax, 6% alcohol, etc., while a few salts as for example calcium chloride, decrease the solubility of the hydrate in water, thus retarding the set, other salts as for example sodium chloride, magnesium chloride, ammonium chloride and others increase its solubility and hence accelerate the set.—*Tonindustrie-Zeitung* (1928) **52,** 77, pp. 1551-52.

Scientific Management of Lime Plants Executed Upon the Basis of Time Studies—Carl Lange classifies the work in lime plants as purely hand labor, semi-mechanized labor and fully mechanized labor. In spite of extensive mechanizations, especially in the larger plants, hand labor still handles a large portion of the work being done in lime plants. The foundation for rationalizing this human labor is time study, and the aim of time study is to secure maximum results in work with minimum effort. Standard tools, suitable regulations for each labor operation and other provisions should guide the labor processes in the plant. Time study is divided into production study which embraces the entire labor required for finishing the product, capacity or efficiency study which embraces each minor laboring process and motion study, which embraces the motions and motion elements of each minor work. The methods and psychology of approaching the laborers and of conducting the time studies are discussed; the evaluation of the time studies will be shown in a later issue.—*Tonindustrie-Zeitung* (1928) **52,** 76, pp. 1532-34.

Process for Burning Cements—Especially portland and fused cement, in tunnel kilns, whereby forced air is charged at high pressure, are characterized by this, that the material for burning is supplied as unprepared or merely coarsely prepared mix of the constituents of the raw material in its natural obtainable condition. The forced air supplied at high pressure to the sintering zone or near it effects an instantaneous sintering of the material. Patent applied for A. 47419 V/80 c.—*Zement* (1929), **18,** 8, p. 233.

Gypsum, Its Manufacture and Uses—Dr. Martell gives a general description in reference to the German gypsum industry.—*Baumarkt* (1928) 39, pp. 1325-26; 43, pp. 1452-53.

Basalt as a Building Material—After describing the distribution of basalt deposits and the development of the German basalt industry including applications of basalt to marine and road construction, the process for manufacturing basalt plates and cast basalt products are described. Basalt is a volcanic rock of an average specific weight of 3.0, and of 49,782 3500 to 5000 kg. per sq. cm. (49,782 to 71,117 lb. per sq. in.) compressive strength or more. At the Basalt A.-G. in Linz a. Rhine basalt of pure quality, uniform structure, great hardness and high compressive strength is crushed, sized, screened, stored, then sized as needed in special machines if special grains are to be secured, washed and then mixed with cement in desired proportion within a mixer, great pains being taken throughout the process, since the securing of a really high-grade artificial stone demands the very best in raw materials and constantly accurate mixing proportions. Hence the cement is tested before use, and also the purity and quality of the raw basalt. From the mixers the material enters the press room where heavy percussion presses turn it into the proper shape. The plates remain here for several days until hardened and are then placed in storage. Basalt curb stones and other stones are

made also, using presses of special design, and other basalt products with compressed air-operated tampers, etc. Special treatment may be given to secure chiseled or other desirable effects. This process, however, is unsuitable for securing basalt products of complicated or exactly symmetrical shape and hence the basalt-casting process has been developed. Basalt has a melting point of between 900 and 1,100 deg. C. (1652 and 2012 deg. F.), and it was first molten and cast for building purposes by the French Doctor Ribbe in 1909. Originally cast basalt was black vitreous and uncommonly brittle, but after a better knowledge of the laws of the crystallization of silicate mitures, the melting and cooling process could be properly adjusted to secure the original solid crystal texture. The melting process increased the great hardness to wear 50%, and the considerable compressive strength at least double, while the chemical resistance was increased tenfold to nearly hundredfold. This process of "recreating" the basalt rock is carried on at the Compagnie Generale du Basalte in Paris and the Schmelzbasalt A.-G. in Linz a. Rh. The raw basalt is broken to the size of broken stone or chipped stone and fed continually into a gas-fired melting furnace. The molten mass is fed in a constant flow into a gas-heated tipping forehearth from which it is cast into forms having shining smooth or dull matte surfaces and consisting of good or poor heat-conducting material. After having cooled just sufficiently, the cast is rid of the form and set into the devitrifying kiln, which is a tunnel kiln with endless chain, in which the vitreously cooled edges and corners of the cast basalt are carried over into the crystalline phase. The casts pass then upon a traveling band slowly through the cooling chamber, cooling from a light red glowing condition, and fully crystallized, to the outdoor temperature, after which they are tested for strength and tension by the percussion, bending, etc. —*Baumarkt* (1928) **41,** pp. 1387-1389.

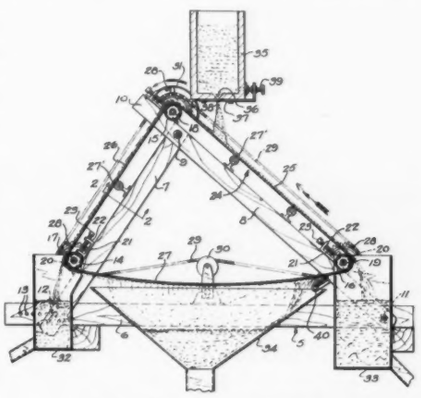
On the Theory of Grinding—M. J. Nerkritsch and Peter P. Budnikoff of the Technological Institute Charkow, Russia, review the literature relative to the theory of grinding, selecting the results on the nature of the materials and their grinding in respect to the efficiency of grinding machines, using at least 28 references, including S. G. Ure, F. A. Kirkpatrick, A. J. Dale, G. Martin, A. Bowers, J. Christelow, F. Turner and W. A. Koehler.—*Zement* (1929) **18,** 7, pp. 194-7; 8, pp. 230-3.

K1-Storage—Attempt to Explain Decreases in Strength—Variable Hardening of High-Grade Portland Cements—Further results of investigations and discussions on the subject of K1 storage or 28-day damp air-water storage with a consequent 28-day water storage for determining variablity in hardening.—*Tonindustrie-Zeitung* (1928) **52,** 85, pp. 1697-1701.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Sand Grader—Grains are separated by the ability of the larger grains to roll on an inclined belt while the smaller grains adhere to the belt. The device has a belt running over rollers which are at the apices of a triangle. The sand is fed on the side of the belt that is going up, inclined about

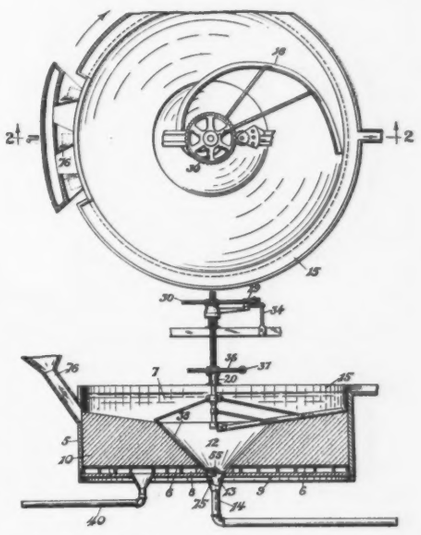


Sand grading machine

45 deg. The coarser grains roll down and fall into a receptacle and the finer go over the roller at the top. The belt on the down side is steeper than on the up side so that some of the grains detach themselves and roll down into another receptacle, while only the finest adhere to the belt and are brushed or washed off into a third receptacle below, thus separating the sand into three sized products. Other forms than the triangle would give more angles and more separations. The method might be used for separating round from flat grains.—*Damon D. Dunkin,* January 22, 1929; Patent 1,699,522.

Plastic Lime Process—The patent describes a method for increasing the plasticities of either a calcium or dolomite lime and a machine for use in the process. The patentee claims that by throwing particles of hydrate the impinging action resulting from abruptly changing the direction of throw, with the operation all being in a closed air circuit, a hydrate of such particle shape and size results that the particles resemble air floated material, and this hydrate has an apparent decrease in specific gravity. By subjecting the hydrate to treatment in the machine, high calcium or dolomite lime of greater plasticity is secured than would be the case if not otherwise treated. The patentee points out that increased plasticity is produced by the addition of ¼% of sodium hyposulphite under conditions where rapid rises of temperature due to the slacking reaction is prevented. He further claims his machine is especially efficient for this treatment of lime hydrates under this process. The machine is essentially a hammer type pulverizer unit with a specially designed fan and fan runner which also has means for collecting the hydrate produced. — *Hippolyt Dittlinger,* U. S. Patent No. 1,664,598.

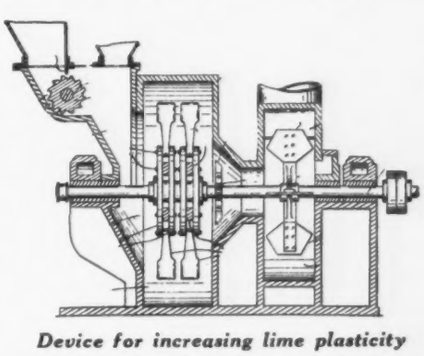
Thickener—The device combines thickening by sedimentation with filtration, the settled solids being scraped off the filter as fast as they are deposited. The filter is a thick bed of sand, charcoal or other suitable material resting on cocoa matting or small stones which are on a perforated false bottom in a flat cylindrical tank. Suction may be used to hasten the filtering. The solids



Sedimentation and filtration machine

are scraped from the filter bed by a curved scraper which is shaped so as to work the solids to a central conical well from which they flow out through a discharge pipe. The use of a diaphragm pump to regulate and assist this discharge is recommended. The clear liquid overflows at a lip on the periphery of the tank.—*A. L. Bloomfield et al.* February 12, 1929. Patent No. 1,702,193.

Plaster Board—The author of this patent describes his method of protecting the edges of gypsum wallboard which consists primarily of a method of folding the bottom and cover sheets and lapping at the edge so as to accomplish this end. The edges of of the board can be made smooth or burred by allowing the plaster to extrude through openings provided.—*C. W. Utzman, assignor to U. S. Gypsum Co. U. S. No.* 1,703,183.



Device for increasing lime plasticity

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Apr. 20	Apr.27	Apr. 20	Apr. 27
Eastern	3,491	3,882	9,432	10,907
Allegheny	3,310	3,490	6,128	6,577
Pocahontas	585	602	744	1,146
Southern	594	533	8,756	9,318
Northwestern	963	1,298	5,176	5,406
Central Western	601	524	9,644	9,472
Southwestern	564	444	6,281	6,515
Total	10,108	10,773	46,161	49,341

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

	Limestone Flux		Sand, Stone and Gravel	
	1928	1929	1928	1929
	Period to date		Period to date	
District	Apr. 28	Apr. 27	Apr. 28	Apr. 27
Eastern	35,970	43,523	59,235	59,929
Allegheny	48,941	49,806	58,474	54,402
Pocahontas	4,764	4,522	10,607	7,838
Southern	9,074	7,700	155,617	123,312
Northwestern	13,093	12,319	46,651	35,959
Central Western	6,830	8,580	107,623	105,268
Southwestern	6,817	7,028	80,375	86,335
Total	125,489	133,478	518,582	473,043

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	1929
Limestone flux	*125,489*	*133,478*
Sand, stone, gravel	*518,582*	*473,043*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning May 18:

CENTRAL FREIGHT ASSOCIATION DOCKET

21508. To revise all commodity rates on **sand and gravel, crushed stone** and **commercial slag (road building material)**, carloads, between points in Ohio (state traffic), involving single line hauls, to the following mileage scale basis as minimum:

Distance scale	Rate, cents
20 miles and under	60
40 miles and over 20	80
60 miles and over 40	80
80 miles and over 60	90
100 miles and over 80	100
125 miles and over 100	110
150 miles and over 125	120
175 miles and over 150	130
200 miles and over 175	140

Joint haul rates are to be a minimum basis of 20c per net ton in excess of the single line scale mentioned hereinabove.

21516. To establish on **sand and gravel**, carloads, Lafayette, Ind., to points shown below, following rates in cents per net ton: Proposed rate on sand and gravel to Wolcott and Remington, Ind., 80c; Goodland, Ind., 85c; Kentland and Effner, Ind., 90c. Route: Via C. I. & L. Ry. to Reynolds, Ind., P. R. R. beyond. Present rates, sixth class.

21517. To establish on **sand and gravel** in straight or mixed carloads, Willey's and Miami, O., to Cincinnati, O., following rates (rates in cents per ton of 2000 lb.):

From	Pres.	Prop.
Willey's, O., to Cincinnati, O.	....	†
Miami, O., to Cincinnati, O.	*45	‡60
Miami, O., to Cincinnati, O.	§50	‡60

†C. & O. Ry. Tariff 1241-E, I. C. C. 10329 (Item 350).

‡Rate to Cincinnati, O., when for delivery on connecting line tracks, 50c; switching charges in addition.

*When for deliveries in Cincinnati switching district north of the Ohio river.

§When for deliveries in Cincinnati switching district south of the Ohio river.

Rates to points in Cincinnati switching district are subject to maximum absorption of 10c per 2000 lb., or $5.50 per car.

21570. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, Wolcottville, Ind., to destinations shown below, following rates in cents per ton of 2000 lb.:

To	Pres.	Prop.
Angola, Ind.	*85	*85
Carroll's Crossing, Ind.	†230	85
Fremont, Ind.	§97	85

*P. R. R. 117-A, I. C. C. F-1918. Present rate applicable via Sturgis, Mich., and N. Y. C. R. R. Proposed to restrict routing to apply only via Kendallville, Ind, and N. Y. C. R. R.

†Classification basis.

§P. R. R. 117-A, I. C. C. F-1918.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

21565. To establish on **agricultural limestone**, also **pulverized limestone** and **ground limestone**, carloads, Hillsville and Walford, Penn., to destinations on P. & L. E. R. R. and Monongahela Ry., rates as shown in Exhibit "A" attached. Present and proposed rates, as shown in Exhibit "A" attached.

EXHIBIT "A"

Present and Proposed Rates on Agricultural, Pulverized and Ground Limestone, Carloads, from Hillsville-Walford District

(Present rates in cents per 100 lb.; proposed rates, 150% of 15329 scale, in cents per net ton)

To	Pres.	Prop.
P. & L. E. R. R. Co.		
Scott Haven, Penn.	9	150
Douglass, Penn.	9	150
Smithdale, Penn.	9	150
West Newton, Penn.	9	150
Smithton, Penn.	9	150
Jacobs Creek, Penn.	9	150
Perryopolis, Penn.	10	150
Fuller, Penn.	10	150
Vanderbilt, Penn.	10	165
Dickerson Run, Penn.	10	165
Rainey, Penn.	10	165
Connellsville, Penn.	10	165
Monongahela, Penn.	9	150
Webster, Penn.	9	150
Monessen, Penn.	9	150
Belle Vernon, Penn.	9	150
Fayette City, Penn.	10	150
Landon, Penn.	10	165
Newell, Penn.	10	165
Brownsville, Penn.	10	165
Monongahela Ry. Co.		
Alicia, Penn.	10	165
Maxwell, Penn.	10	165
East Millsboro, Penn.	10	165
Arensburg, Penn.	10	165
Isabella, Penn.	10	180
Gates, Penn.	10	180
Huron, Penn.	10	180
Masontown, Penn.	10	180
Ifield, Penn.	10	180
Martin, Penn.	10	180
Poland, Penn.	10½	180
West Van Vooris, Penn.	10½	180
Maidsville, Penn.	10½	195
Osage, Penn.	10½	195
Price, W. Va.	10½	195
Brave, W. Va.	10½	195
Morgantown, W. Va.	10½	195
Louisville, W. Va.	11	195
Hite, W. Va.	11	210
Riversville Jct., W. Va.	11	210
Radcliffe, W. Va.	11	210
Prickett, W. Va.	11	210
Fairmont, W. Va.	11	210
Simpson, Penn.	10	165
Ralph, Penn.	10	165
Brier Hill, Penn.	10	165
Shamrock Works, Penn.	10	165
Ache Jct., Penn.	10	165
Lechrone, Penn.	10	165
Edenborn, Penn.	10	180
Lardin, Penn.	10	180
Rices Landing, Penn.	10	165
Nemacolin, Penn.	10	180

21567. To establish on **quarry scrap** or **waste**, carloads, minimum weight 70 net tons, from Marblehead, O., to Bay Bridge, O., rate of 25c per net ton. Present rate, 40c per net ton, minimum weight 40,000 lb.

21577. To establish on **sand and gravel**, carloads, Troy, O., to destinations shown below, following rates, in cents per net ton:

To	Prop.
Springfield, O.	65
Columbus, O.	70
Mechanicsburg, O.	70
Delaware, O.	80
Urbana, O.	75
Kenton, O.	90
Forest, O.	90
Dayton, O.	70
Carlisle, O.	70
West Manchester, O.	70
Greenville, O.	70
Ansonia, O.	80
Celina, O.	80

Present rates, sixth class.

21586. To establish on **sand and gravel**, carloads, Mantua, O., to Deerfield, Newton Falls and Palmyra, O., 75c per ton of 2000 lb. Present rate, 80c per ton of 2000 lb.

21587. To establish on **refuse limestone screenings or quarry scrap**, carloads, Annandale and Branchton, Penn., to Universal, Penn., 70c per 2000 lb. Present rate, 88c per 2240 lb.

21594. To establish on **sand**, carloads, Toledo, O., to Cleveland, O., 90c per ton of 2000 lb., to expire 60 days from effective date. Present rate, 120c per ton of 2000 lb.

21604. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) **or gravel**, carloads, Jamestown, N. Y., to Canaseraga, N. Y., rate of 120c per ton of 2000 lb. Present—Sixth class, 310c per ton of 2000 lb.

21613. To establish on **fluxing (furnace or foundry) limestone**, carloads, Hillsford and Walford, Penn., to Pittsburgh, Penn., rate of 80c per ton of 2240 lb. Present—90c per ton of 2240 lb.

21625. To establish on **sand and gravel**, carloads, Gravel Bank and Marietta, O., to destinations in West Virginia, rates as shown in Exhibit A attached. Present and proposed—As shown in Exhibit A attached.

EXHIBIT "A"

Ravenswood, Spencer & Glenville Branch

To	Proposed	Present
Silverton, W. Va.	120	80
Meadowdale, W. Va.	120	90
Liverpool, W. Va.	120	90
Billings, W. Va.	130	100
Spencer, W. Va.	130	100
Ripley & Mill Creek Valley Branch		
Cottageville, W. Va.	130	90
Ripley, W. Va.	130	90
Little Kanawha R. R.		
Hallen, W. Va.	100	70
Newark, W. Va.	100	70
Elizabeth, W. Va.	110	80
Owensport, W. Va.	110	80

21626. To establish on **sand and gravel**, carloads, Evansville, Ind., to Oakland City, Ind., rate of 73c per net ton. Present rate—76c per net ton.

21627. To establish on **silica rock, crude unground**, carloads, in open top cars, Copley, O., to Lucas and Hays, Penn., rate of 140c per net ton. Present rate—Sixth class rate of 16¼c.

21629 (Cancels W. D. A. 21508). To revise all commodity rates on **sand and gravel, crushed stone** and **commercial slag** (road building material), carloads, between points in Ohio (state traffic), involving single line hauls, to the following mileage scale basis as minimum. In cents per net ton:

Distance scale	Rate
20 miles and under	60
40 miles and over 20	70
60 miles and over 40	80
80 miles and over 60	90
100 miles and over 80	100
125 miles and over 100	110
150 miles and over 125	120
175 miles and over 150	130
200 miles and over 175	140

Joint haul rates are to be a minimum basis of 20c per net ton in excess of the single line scale mentioned hereinabove.

21637. To establish on **crushed stone** and other articles grouped therewith, carloads, Milltown, Ind., to Blotcher, Ind., rate of 96c per net ton. Present rate—Sixth class.

SOUTHERN FREIGHT ASSOCIATION DOCKET

45319. **Jetty stone** from Stockbridge, Ga., to Miami, Fla. Present rate, 340c per net ton; proposed rate on jetty stone, carloads (See Note 3), from and to points named, 300c per net ton. Same as rate suggested under Submittal 44961, from Columbia, Blair, Rockton and Parkhill, S. C.

45382. **Shale**, from Fairmount, Ga., to Jacksonville, Fla. It is proposed to establish rate of 198c per net ton on shale, in bulk, carloads (See Note 1), from Fairmount, Ga., to Jacksonville, Fla. Made with relation to rates that have been established to other southeastern points.

45426. **Stone (including dolomite), crushed or broken**, from and to Alabama points; minimum carload weight. It is proposed to revise the present minimum weight governing the carload rates on stone (including dolomite), crushed or broken, as published in Southern Ry. Alabama Furnace Material Tariff (Freight Tariff 993-B), to read as follows: "Carload minimum weight 90% of marked capacity of car, except when car is loaded to full visible capacity actual weight shall govern." Proposed in order to clarify the present minimum weight.

SOUTHWESTERN FREIGHT BUREAU DOCKET

17444. **Crushed stone**, from Cape Girardeau, Mo., to Memphis, Tenn. To establish a rate of $1.13 per ton of 2000 lb. on crushed stone, carloads, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb. marked capacity will govern, from Cape Girardeau, Mo., to Memphis, Tenn. The Missouri Pacific is being extended into Cape Girardeau, Mo., and desires to operate this rate, which is now applicable via the St. L.-S. F. Ry. in St. L.-S. Tariff 3170G.

17479. **Sand or gravel**, from Ft. Gibson, Okla., to North Spadra, Ark. To establish a rate of 7c per 100 lb. on sand or gravel, carloads (See Note 1), from Fort Gibson, Okla., to North Spadra, Ark. It is desired to provide rates on sand and gravel equal to the 9702 joint scale for class "A" lines.

WESTERN TRUNK LINE DOCKET

5319. **Sand, gravel, stone (crushed, chip, dust, riprap and rubble)**, carloads (See Note 2), except when weight of shipment loaded to full visible capacity of car is less, actual weight will apply, but not less than 40,000 lb., from points in Nebraska to points in Iowa. Present—Nebraska joint line scale applicable on sand, gravel or stone (crushed or pulverized), carloads. Proposed—Amend present description of Item 9225A of W. T. L. Tariff 18M to read: "Sand, gravel, stone (crushed, chip, dust, pulverized, riprap and rubble), carloads."

6887. **Stone, crushed or ground, grout (broken stone), chatts, crushed, slag and strippings of stone quarries**, carloads, from Montello, Wis., to Manitowoc, Wis., on traffic destined points east of the Illinois-Indiana state line. Present, 100c per net ton; proposed, 85c per net ton. Present and proposed minimum weight (See Note 3), but in no case shall the minimum weight be less than 40,000 lb.

6289A. **Sand**, carloads (See Note 2), but not less than 40,000 lb., from Nicols, Minn., to Milwaukee, Wis. Present, 12c per 100 lb.; proposed, 9c per 100 lb.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4841B. To establish commodity rates on **flint and silica**, crude or ground, in bulk or in packages, carloads, from Cox, Ill., to destinations in I. R. C. territory. To (representative points):

	Rates per ton
Belvidere, Ill.	$2.50
Chicago, Ill.	2.50
Milwaukee, Wis.	2.70
Macomb, Ill.	1.50

4805. Sub. 1. **Sand**, carloads, from Milwaukee, Wis., to Dubuque, Ia., usual minimum. Present rate, $2 per gross ton; proposed, $1.50 per net ton.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

16839. **Common building sand** (A); run of bank or screened or crushed gravel (B); (See Note 3) from Westboro, N. H., to Woodstock, Vt. Present, (A-B) 15 ($3 per net ton); proposed (A) $1.25 per net ton, (B) $1.30 per net ton. Reason—To grant shippers rates to Woodstock, Vt., comparable with rates now in effect to other stations.

16854. **Stone, broken or crushed**, minimum weight in bulk in open cars (See Note 2), from Plainville (Cook's Quarry), Conn., Branford (Pine Orchard Quarry), Conn.; Westfield (Hampden Quarry), Mass., to stations on the N. Y. N. H. & H. R. R. (Exhibit showing present and proposed rates will be furnished upon request.) Reason—To permit of this traffic moving over the railroad as against highway competition.

16868. To provide for the absorption of the Boston & Albany R. R. switching charge at Springfield, Mass., not to exceed 38c per net ton in the commodity rate of 7c per 100 lb. on **ground, unburned or broken limestone**, from North Adams, Mass., to Springfield, Mass., published in B. & M. R. R. I. C. C. No. A2600. **At present this switching** charge which is published in B. & A. R. R. I. C. C. No. 8933 applies in addition to the rate. Reason—To meet carrier competition.

TRUNK LINE ASSOCIATION DOCKET

20733. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), to Marlton, N. J.

From—	Prop. rate
Morrisville and Tullytown, Penn.	90
Masonville to S. Pemberton, N. J.	75

Rates in cents per net ton.

Reason—The proposed rates are comparable with rates now in force from the same origins to Sea Girt, Toms River, Camden, Bordentown, N. J.

20734. (A) **Crushed stone**, carloads, (B) **crushed stone screenings**, carloads (See Note 2), from North LeRoy, N. Y., to Menden, N. Y., (B) 75c; Victor, N. Y. (A), (B), 75c per net ton. Reason—The proposed rates are comparable with rates on like commodities from and to points in the same general territory.

20735. **Sand and gravel**, carloads (See Note 2), from Baltimore, Md., to Bradshaw, Md., 80c per net ton. Reason—The proposed rate is comparable with rates on like commodities from and to points in same general territory.

20738. **Building sand**, carloads (See Note 2), from Mapleton District, Penn., to Blairsville, Penn., $1.50 per net ton. Reason—The proposed rate is comparable with rates on like commodities from and to points in the same general territory.

20744. **Stone, natural, crushed**, carloads (See Note 2), from Mill Hall, Penn., to **stations on the** N. Y. C. R. R. in the state of Pennsylvania: Nelson, Lock Haven, Snow Shoe, Morrisdale, Bigler, Chase, Clearfield Burnside, Cherry Tree, Shanktown, Penn., and various, rates ranging from 60c to $1.30 per net ton. Reason—The proposed rates are comparable with rates on like commodities for like distances, services and conditions and are also based on scale ordered by the Public Service Commission, P. S. C. Pa. Dockets Nos. 7530 and 7553.

20750. *__Crushed stone and stone screenings__, carloads (See Note 2), from Blair Limestone Co., Ltd., No. 4, Penn., to Pittsburgh, Penn., $1.40 per net ton. Reason—The proposed rate is comparable with rates now in force from Bellefonte, Pleasant Gap, Penn., to Pittsburgh, Penn.

*Will not apply on agricultural limestone or ground limestone, unburnt, fluxing stone or fire stone.

20754. **Sand and gravel**, carloads (See Note 2), from Kenvil, N. J., to all stations on the Rahway Valley R. R., 85c per net ton. Reason—To meet motor truck competition.

20755. **Crushed stone**, carloads (See Note 2), from Norfolk, N. Y., to Burke and Chateaugay, N. Y., $1.07 per net ton. Reason—To meet motor truck competition.

20758. **Crushed stone**, carloads (See Note 2), from Ormrod, Penn., to Jutland, Grandin, N. J., $1, and to Manville, Port Reading Junction, Bound Brook, Lincoln and New Market, N. J., $1.15 per net ton. Reason—The proposed rates compare favorably with rates from Bethlehem, Penn.

20759. **Crushed stone**, carloads (See Note 2), from Lime Crest, N. J., to Wilkes-Barre, Penn., $1.80, and to Scranton, Penn., $1.95 per net ton. Reason—The proposed rates are comparable with rates on like commodities for like distances, services and conditions.

20791. **Limestone, crude, fluxing, foundry and furnace**, when shipped in open top equipment, carloads (See Note 2), from points shown in Item No. 3390 of Agent Curlett's I. C. C. A-239 taking Group Nos. A, B, C and D, to Franklin, Penn., proposed rates from Group A, $1.66; from Group B, $1.76; from Group C, $1.86, and from Group D, $1.96 per gross ton (present rate 16c per 100 lb.). Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

20814. **Crushed stone and screenings**, carloads (See Note 2), from Stover, Penn., to Tyrone, Penn., 60c per net ton (present rate 70c per net ton). Reason—Proposed rates are comparable with rates on like commodities from and to points in the same territory.

20826. **Gravel and sand** (other than blast, engine, fire, glass, molding or foundry, quartz, silex and silica), carloads (See Note 2), from Port Covington (Baltimore), Md., to Clearspring, Md., $1.30 per net ton (present rate $1.75 per net ton). Reason—Proposed rate is comparable with rates to Hagerstown, Williamsport, Md., and Shippensburg, Penn.

20828. **Crushed stone**, carloads (See Note 2), from Union Stone Co., Billmyer and Bainbridge, Penn., to Glen Rose, Buck Run, Doe Run, Springdell, Green Lawn, Clonmell and Chatham, Penn., 90c per net ton (present rate $1.05 per net ton). Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

20845. **Sand**, carloads (See Note 2), from Masonville to South Pemberton, N. J., inclusive, to Williamstown, N. J., $1.50 per net ton (present rate $2.43 per net ton). Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

20853. **Gravel and sand**, N. O. I. B. N., in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Morristown and Netcong, N. J., to Hurd, N. J., $1 per net ton. Reason—Proposed rates compare favorably with rates from Morristown to Dover and Bartley, N. J.

20859. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, and/or **gravel**, carloads (See Note 3).

FROM ARUNDEL, MD.

To—	Proposed rate	Present rate
Collington, Md.	75	80
Mulliken, Md.	75	....
Hall, Md.	75	....
Kenwood, Md.	85	....
Catonsville, Md.	85	....
Stemmers Run, Md.	90	....
Glen Rock, Penn.	115	....
Hanover Junction, Penn.	115	....
Smyser, Penn.	115	....
Perryman, Md.	100	....
Short Lane, Md.	100	....
Aberdeen, Md.	100	105
Principio, Md.	105	....
Charlestown, Md.	115	....
Northeast, Md.	115	....
Elkton, Md.	125	....
Quarry, Penn.	105	....
Washington Boro, Penn.	150	....
Columbia, Penn.	150	....
Hollins, Md.	90	....
Brooklandville, Md.	90	....
Ruxton, Md.	90	....
Riderwood, Md.	90	....
Lutherville, Md.	90	....
Phoenix, Md.	100	....
Sparks, Md.	100	....
Glencoe, Md.	100	....
Monkton, Md.	100	....
White Hall, Md.	100	....
Parkton, Md.	100	....
Bentley Springs, Md.	100	....
Freeland, Md.	105	....
Brilhart, Penn.	125	....
York, Penn.	125	....

The above rates in cents per 100 lb.

Reason—Proposed rates are comparable with rates to Rosslyn, Va., Port Deposit, Md., Safe Harbor, Penn., etc.

20869. (A) **Sand**, other than blast, engine, foundry, moulding, glass, silica, quartz or silex, carloads. (B) **Crushed stone**, carloads (See Note 3).

	To Fullerton, Penn.			
	Proposed		Present	
From	(A)	(B)	(A)	(B)
Morrisville and Tullytown, Penn.	150	150	160	.....
Masonville to South Pemberton, N. J.	150	.....	185	.....

The above rates in cents per 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

20875. **Limestone, ground or pulverized, and stone dust**, carloads, minimum weight 50,000 lb., from Jamesville, N. Y., to N. Y. C. R. R. and W. S. R. R. stations, Staatsburg, Schenectady, Utica, Albany, Rochester, Auburn, Fulton, Camden, Carthage, Ogdensburg, Piercefield, Malone, Ferenbaugh, So. Amsterdam, Akron, Montgomery, E. Syracuse and various, rates ranging from 90c to 220c per net ton. Reason—Proposed rates are fairly comparable with rates now in force from Jordanville, N. Y.

Portland Cement Production for April

Production Is 1.3% More Than April, 1928, and Shipments 0.1% More—Stocks Increase 8.7% Over Same Date a Year Ago

THE PORTLAND CEMENT INDUSTRY in April, 1929, produced 13,639,000 bbl., shipped 13,319,000 bbl. from the mills, and had in stock at the end of the month 30,044,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in April, 1929, showed an increase of 1.3% and shipments an increase of 0.1% as compared with April, 1928. Portland cement stocks at the mills were 8.7% higher than a year ago.

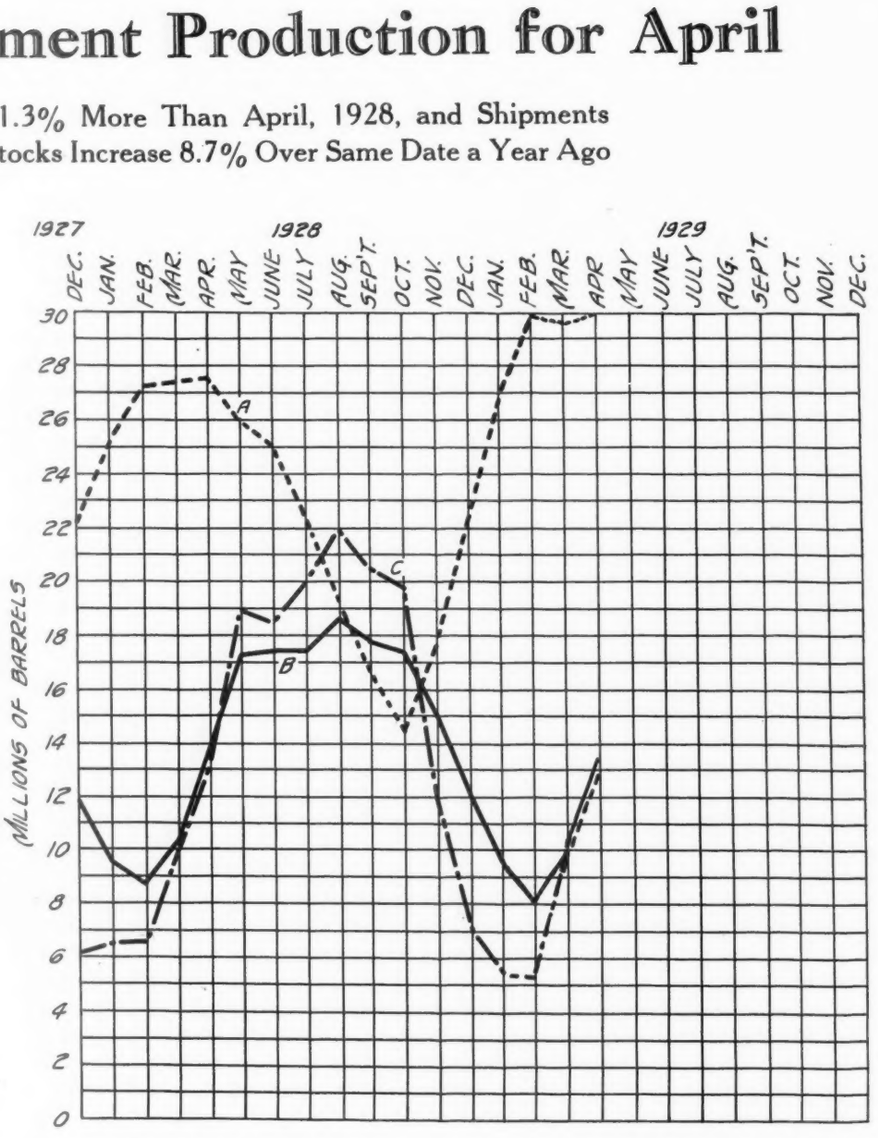
The statistics here presented are compiled from reports for April, from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 159 plants at the close of April, 1929, and of 156 plants at the close of April, 1928. In addition to the capacity of the new plants which began operating during the 12 months ended April 30, 1929, the estimates include increased capacity due to extensions and improvements at old plants.

RELATION OF PRODUCTION TO CAPACITY

	Apr. 1929 Pct.	Apr. 1928 Pct.	Mar. 1929 Pct.	Feb. 1929 Pct.	Jan. 1929 Pct.
The month	67.1	70.0	47.4	44.8	46.5
12 months ended	71.1	74.0	70.9	71.0	71.0

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during February and March, 1928 and 1929:


1927
1928
1929
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC. JAN. FEB. MAR. APR MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC.
MILLIONS OF BARRELS
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
A
B
C

(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portlan cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN FEBRUARY AND MARCH, 1928 AND 1929, IN BARRELS*

Shipped to	1928—February	1929	1928—March	1929
Alabama	254,968	105,162	282,379	127,916
Alaska	928	0	264	525
Arizona	72,365	58,844	81,586	57,406
Arkansas	76,288	40,599	101,428	93,133
California	909,617	†900,811	937,253	1,063,895
Colorado	33,593	25,474	60,381	59,854
Connecticut	52,401	54,574	113,752	106,492
Delaware	11,304	14,459	19,230	19,112
District of Columbia	55,069	58,207	62,160	86,492
Florida	105,590	92,217	114,798	100,388
Georgia	97,616	73,064	157,171	95,061
Hawaii	26,923	20,683	39,411	22,366
Idaho	11,020	3,792	23,994	20,842
Illinois	401,092	251,883	700,881	612,069
Indiana	102,747	87,506	232,338	251,934
Iowa	41,520	21,406	149,705	123,637
Kansas	107,291	56,678	194,957	217,559
Kentucky	52,748	32,328	103,113	102,241
Louisiana	97,484	81,109	115,669	104,285
Maine	10,738	15,199	18,704	19,229
Maryland	66,413	59,087	123,334	131,729
Massachusetts	100,548	79,633	160,730	165,380
Michigan	287,114	273,538	433,110	474,902
Minnesota	49,334	44,013	128,332	136,193
Mississippi	50,677	50,254	73,937	75,353
Missouri	170,275	109,614	333,221	342,697
Montana	10,578	5,570	27,231	20,068
Nebraska	33,967	15,409	88,491	88,438
Nevada	4,524	†6,905	7,568	9,755
New Hampshire	18,066	17,091	25,575	32,824
New Jersey	296,641	247,004	505,016	485,067
New Mexico	21,302	16,549	30,606	25,796
New York	768,681	667,767	1,237,218	1,285,742
North Carolina	100,830	85,373	209,006	159,570
North Dakota	2,641	2,502	18,274	16,912
Ohio	298,885	253,420	540,347	564,820
Oklahoma	203,245	112,301	294,206	318,321
Oregon	74,793	†34,873	78,121	81,126
Pennsylvania	404,956	373,929	657,006	715,616
Porto Rico	0	3,745	1,329	420
Rhode Island	18,701	25,497	47,707	43,300
South Carolina	75,677	74,035	119,612	100,091
South Dakota	10,434	4,361	25,694	32,110
Tennessee	109,112	80,026	174,774	140,815
Texas	383,884	424,778	546,960	621,387
Utah	15,131	11,850	35,955	28,712
Vermont	15,902	14,066	14,737	24,984
Virginia	104,674	83,678	173,697	138,772
Washington	128,568	68,792	162,335	213,399
West Virginia	44,944	35,675	81,273	70,720
Wisconsin	91,829	74,696	148,969	197,738
Wyoming	8,427	3,818	13,571	7,672
Unspecified	22,737	47,710	57,761	28,918
	6,514,792	5,401,554	10,084,877	10,063,783
Foreign countries	48,208	46,446	50,123	49,217
Total shipped from cement plants	6,563,000	5,448,000	10,135,000	10,113,000

*Includes estimated distribution of shipments from three plants in February, 1928 and 1929, and in March, 1928; from four plants in March, 1929.
†Revised.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN APRIL, 1928 AND 1929, AND STOCKS IN MARCH, 1929, IN BARRELS

District	Production 1928—April—1929		Shipments 1928—April—1929		Stocks at end of month 1928—April—1929		Stocks at end of Mar. 1929*
Eastern Penn., N.J. and Md.	3,084,000	3,005,000	3,303,000	3,165,000	6,488,000	6,781,000	6,941,000
New York and Maine	831,000	900,000	850,000	732,000	1,847,000	2,242,000	2,073,000
Ohio, Western Penn., W.Va.	1,321,000	1,401,000	1,154,000	1,274,000	3,577,000	3,777,000	3,650,000
Michigan	1,056,000	964,000	846,000	897,000	2,467,000	2,658,000	2,591,000
Wis., Ill., Ind. and Ky.	1,438,000	1,903,000	1,670,000	1,608,000	3,429,000	4,343,000	4,049,000
Va., Tenn., Ala., Ga., Fla., La.	1,381,000	1,117,000	1,276,000	1,251,000	2,040,000	2,114,000	2,248,000
Eastern Mo. Ia., Minn., S.D.	1,142,000	1,150,000	1,154,000	1,086,000	3,901,000	4,362,000	4,297,000
West'n Mo., Neb., Kan., Okla.	906,000	932,000	803,000	1,034,000	1,566,000	1,395,000	1,497,000
Texas	557,000	622,000	538,000	625,000	468,000	443,000	446,000
Colo., Mont. and Utah	200,000	217,000	217,000	259,000	465,000	409,000	451,000
California	1,254,000	1,085,000	1,184,000	1,058,000	929,000	920,000	894,000
Oregon and Washington	298,000	343,000	312,000	330,000	450,000	600,000	587,000
	13,468,000	13,639,000	13,307,000	13,319,000	27,627,000	30,044,000	29,724,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1928 AND 1929, IN BARRELS

Month	1928—Production—1929		1928—Shipments—1929		Stocks at end of month 1928	1929
January	9,768,000	9,881,000	6,541,000	5,707,000	25,116,000	26,797,000
February	8,797,000	8,522,000	6,563,000	5,448,000	27,349,000	29,870,000
March	10,223,000	9,969,000	10,135,000	10,113,000	27,445,000	*29,724,000
April	13,468,000	13,639,000	13,307,000	13,319,000	27,627,000	30,044,000
May	17,308,000	.....	18,986,000	.....	25,984,000	.....
June	17,497,000	.....	18,421,000	.....	25,029,000	.....
July	17,474,000	.....	19,901,000	.....	22,580,000	.....
August	18,759,000	.....	21,970,000	.....	19,374,000	.....
September	17,884,000	.....	20,460,000	.....	16,799,000	.....
October	17,533,000	.....	19,836,000	.....	14,579,000	.....
November	15,068,000	.....	11,951,000	.....	17,769,000	.....
December	12,189,000	.....	7,384,000	.....	22,650,000	.....
	175,968,000	.....	175,455,000	.....	.....	.....

*Revised.

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS IN APRIL, 1928 AND 1929, IN BARRELS

District	1928—Production—1929		Stocks at end of month 1928	1929
Eastern Pennsylvania, New Jersey and Maryland	3,067,000	3,100,000	2,000,000	2,648,000
New York and Maine	924,000	952,000	1,125,000	1,413,000
Ohio, Western Pennsylvania and West Virginia	1,411,000	1,394,000	1,998,000	1,790,000
Michigan	1,048,000	1,122,000	1,881,000	1,521,000
Wisconsin, Illinois, Indiana and Kentucky	1,491,000	1,890,000	2,515,000	2,470,000
Virginia, Tenn., Alabama, Georgia, Florida, Louisiana	1,397,000	1,045,000	1,029,000	1,351,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,198,000	1,234,000	1,162,000	1,199,000
Western Missouri, Nebraska, Kansas and Oklahoma	998,000	895,000	657,000	762,000
Texas	556,000	613,000	157,000	216,000
Colorado, Montana and Utah	206,000	224,000	447,000	543,000
California	1,187,000	1,119,000	1,349,000	1,004,000
Oregon and Washington	361,000	424,000	682,000	514,000
	13,844,000	14,012,000	15,002,000	15,431,000

Exports and Imports

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN MARCH, 1929

Imported from	District into which imported	Barrels	Value
Belgium	Los Angeles	73,500	$ 39,839
	Massachusetts	2,043	2,545
	Porto Rico	1,600	2,796
	South Carolina	14,165	17,100
	Total	91,308	$ 62,280
Canada	Maine and N.H.	175	$ 400
Denmark	New York	9,022	9,497
	Porto Rico	21,000	26,670
	Total	30,022	$ 36,167
France	New York	30	$ 172
	San Francisco	9	27
	Total	39	$ 199
Sweden	New York	88	$ 517
	San Francisco	51	56
	Total	139	$ 573
United K'gd'm	New York	8,723	$ 11,653
	Philadelphia	1,503	1,516
	Total	10,226	$ 13,169
	Grand total	131,909	$112,788

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN MARCH, 1929

	Barrels	Value
Alaska	157	$ 513
Hawaii	25,974	56,779
Porto Rico	554	2,421
	26,685	$59,713

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN MARCH, 1929

Exported to	Barrels	Value
Canada	2,131	$ 11,468
Central America	19,933	52,178
Cuba	6,147	18,797
Other West Indies and Bermuda	8,051	19,021
Mexico	3,325	11,032
South America	24,151	88,390
Other countries	5,341	34,278
	69,079	$235,164

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1928 AND 1929

Month	1928—Exports—1929 Barrels	Value	Barrels	Value	1928—Imports—1929 Barrels	Value	Barrels	Value
January	56,400	$ 204,875	78,639	$ 283,002	234,753	$ 342,797	151,302	$ 177,976
February	62,828	221,620	58,886	225,590	164,408	217,525	118,930	123,123
March	74,983	265,719	69,079	235,164	235,930	330,074	131,909	112,788
April	61,676	205,882	.....	.....	249,458	324,371	.....	.....
May	70,173	236,005	.....	.....	190,509	256,872	.....	.....
June	59,536	201,313	.....	.....	266,537	359,637	.....	.....
July	83,759	291,055	.....	.....	112,887	151,877	.....	.....
August	88,736	302,866	.....	.....	259,988	358,858	.....	.....
September	71,995	252,843	.....	.....	173,439	226,295	.....	.....
October	62,137	246,010	.....	.....	152,210	226,909	.....	.....
November	69,313	260,310	.....	.....	67,240	92,468	.....	.....
December	63,120	250,204	.....	.....	175,992	233,300	.....	.....
	824,656	$2,938,702	.....	.....	2,283,351	$3,120,983	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1928 AND 1929, IN BARRELS

Month	1928—Production—1929		Stocks at end of month 1928	1929	Month	1928—Production—1929		Stocks at end of month 1928	1929
January	11,839,000	12,041,000	9,672,000	9,642,000	July	15,981,000	.....	11,707,000	.....
February	11,363,000	11,255,000	12,237,000	12,436,000	August	16,202,000	.....	9,357,000	.....
March	12,501,000	*12,450,000	14,463,000	*14,948,000	September	15,909,000	.....	7,566,000	.....
April	13,844,000	14,012,000	15,002,000	15,431,000	October	15,782,000	.....	5,944,000	.....
May	16,025,000	.....	14,329,000	.....	November	14,930,000	.....	5,953,000	.....
June	15,940,000	.....	12,944,000	.....	December	13,426,000	.....	7,422,000	.....

*Revised.

Plans Made for Marketing Idaho Cement Plant Output

AS A SUGGESTION from the new industries committee of the Pocatello Chamber of Commerce, E. J. Simons, president of the Idaho Portland Cement Co., recently outlined for members the company's plan of distribution and sale, stating that the new plant at Inkom is now completed, the machinery installed and the first grinding of material was to begin soon.

Mr. Simons stated that all of Idaho, northern Utah and southern Montana will be included in the territory in which he expects to sell his product, calling attention to the fact that in this state alone there are 3500 miles of state and federal highway with only 75 miles paved, and while the present oiling program is a step forward it will not suffice for the future, he said.

Figuring highways 20 ft. wide it will take 10,000,000 bbl. of cement to pave Idaho's thoroughfares, Mr. Simons told chamber members. In the past eight years Idaho has consumed 250,000 bbl. of cement and the future for this industry is increasingly bright the speaker said.—*Pocatello* (Idaho) *Tribune.*

Cherokee Company Building New Barge

A NEW barge of 150-ton capacity is to be added to the river fleet of the Cherokee Sand and Gravel Co., it was announced recently by George R. Harris, head of the Harris Boat Construction Co., which received a contract for its construction.

This will be the third barge of the type to be added to the fleet operated by the Cherokee company. The company recently put a new steam dredge in service.

The barge to be constructed immediately, will be 82 ft. in length, 20 ft. 9 in. wide and 4 ft. and 6 in. deep.

It is to be especially designed for the hardest service that may be required of a Tennessee river craft. Longleaf yellow pine of 90% heart timber has been selected.

Sand-Lime Brick Production and Shipments in April

THE following data are compiled from reports received direct from 24 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is three more than those furnishing statistics for the March estimate published in the April 27 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

With increased construction work at this time of the year, production shows a marked increase over the figures for March, although four plants still reported no production for the month. Shipments both by rail and truck showed a good increase. Stocks on hand decreased somewhat, as did unfilled orders.

The following are average prices quoted for sand-lime brick in April:

Average Prices for April

Shipping Point	Plant Price	Delivered
Boston, Mass.	$12.00	$16.00
Buffalo, N. Y.	12.25	16.50
Dayton, Ohio	12.50	15.50
Detroit, Mich.	13.00	15.50
Detroit, Mich.	.....	16.00
Detroit, Mich.	.....	15.50@16.00
Detroit, Mich.	12.00	15.75
Flint, Mich.	12.00	.....
Grand Rapids, Mich.	12.50	.....
Hartford, Conn.	14 00	19.00
Madison, Wis.	12.50	14.00
Menominee, Mich.	11.00	13.50
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	10.00	12.75
Mishawaka, Ind.	11.00	.....
Pontiac, Mich.	15.50	.....
Saginaw, Mich.	12.00	.....
San Antonio, Texas	12.00	14.00
Sebewaing, Mich.	.....	.....
Sioux Falls, S. D.	.....	13.00
Syracuse, N. Y.	18.00	20.00
Toronto, Canada	12.50	15.00

The following statistics are compiled from data received direct from 24 producers of sand-lime brick in the United States and Canada:

Statistics for March and April

	*March	†April
Production	11,432,855	16,154,923
Shipments (rail)	3,944,652	4,358,812
Shipments (truck)	9,497,929	13,579,953
Stocks	14,256,168	14,235,824
Unfilled orders	12,630,000	11,587,000

*Twenty-one plants reporting; incomplete, eight plants not reporting unfilled orders.

†Twenty-four plants reporting; incomplete, seven plants not reporting unfilled orders.

Notes from Producers

Some good sales promotional work is being carried on at this time by Acme Brick Co., Milwaukee, Wis., in a direct-by-mail campaign to encourage the use of sand-lime brick. A series of letters and blotters is being sent out periodically to present and prospective users of sand-lime brick telling of the progress in the art of making brick since the "Chaldeans puttered around with clay." The letters and blotters are very interesting, command attention because of the story they tell, and of course each carries a good word for the use of sand-lime brick in construction, and cites instances where it has been found a very satisfactory material.

San Antonio Sand Lime Brick Co., San Antonio, Texas, report that their press has been overhauled and other machinery repaired. They are furnishing 250,000 brick for the Maverick-Clark Lithograph building, 35,000 brick for the Groos National bank and 90,000 brick for the Grayburg Oil Co. buildings.

U. S. Gypsum's New Indiana Harbor Mill Nearing Completion

THE large gypsum products mill which the U. S. Gypsum is building at Indiana Harbor, Ind., is rapidly approaching completion and is expected to enter production within a short time. Four of the main plant structures are nearly finished and much of the equipment installed.

The last part of the work on the rock storage building is now being done. The longest piles ever driven in the Calumet region are under this building and under the company docks. Over 5000 of them are down in the ground in 60- to 80-ft. lengths. Many thousands of tons of raw gypsum rock product will be unloaded from ships and stored in this building when the plant begins operation.

A big unloading bridge will be ready for operation before the end of the month. It will have a capacity of 600 tons per day. The dock terminal at the plant is said to be the largest of its kind on the Great Lakes. First shipments of raw materials are expected to arrive within the next few weeks. —*Chicago* (Ill.) *Calumet-World.*

Mohawk Limestone Sets Off Large Blast

FIFTEEN tons of dynamite were used to displace more than 100,000 tons of limestone at the Mohawk Limestone Products Co.'s quarry recently. A record was made for the company in the largest single shot ever discharged by the company. The blast brought down a section of the 75-ft. face about 700 ft. long.

It took a day and one-half to load the holes with the charges, according to J. W. Dugan who was in charge of the work. A total of 55, 6-in. holes, 50 to 75 ft. deep were drilled. Each hole carried a charge of from 400 to 700 lb. of dynamite.

S. H. Pierson of the Atlas Powder Co. supervised the loading of the holes. All the holes were fired simultaneously.

A large crowd of interested spectators were scattered on nearby hilltops to watch the blast. There were also a number of invited guests present.—*Utica* (N. J.) *Observer.*

Stockton, Calif., Cement Project Developing

THE PROJECTED new plant of the Port Stockton Cement Co., near Stockton, Calif., will be constructed on the unit plan, the first unit of 3000 bbl. daily capacity will be started within a month and the mill will be finished and in operation prior to January 1, 1930, making a million barrels a year.

Two other units will be started upon the completion of the first unit, which with the first unit, will give a daily capacity of 9000 bbl.

Stockton was selected because of its water facilities, and an especially built boat will be used for the purpose of transporting cement from Stockton to the bay cities. It will be placed in silos in San Francisco and Oakland for distribution.

Fifty men will be permanently employed at the quarry near Columbia and 100 men will be used in opening this quarry and the extension of the railroad.

In Stockton, about 200 men will be employed permanently.—*Stockton* (Calif) *Record.*

Pioneer Company Makes Silt Yield a Profit

THE STATE capitol grounds at Seattle, Wash., needed top dressing, 20,000 cu. yd. of it and an investigation showed that the silt removed from the sand and gravel dredged from the Cedar river was ideal for the purpose. Hence the Pioneer Sand and Gravel Co., operating on the river will soon be sending many barge loads of the silt to the capitol grounds.

The Cedar river silt, authorities point out, will grow things and nowhere else can be found so much topsoil so easily transported.—*Seattle* (Wash.) *Times.*

Diamond Core Drill Manufacturers Meet

PURSUANT to a request from the Diamond Core Drill Manufacturers' Association, there will be a conference of producers and users at 10:30 A. M. (daylight saving time) Monday, May 27, 1929, at the Palmer House, Chicago, Ill., to consider the adoption of a commercial standard for diamond core drill fittings on the basis of engineering data that is now in definite and tabulated form and which can be secured from the United States Bureau of Standards, care of I. J. Fairchild of the Commercial Standard Unit.

All those who are interested in the production or use of diamond core drills are asked to attend and to give previous notice of intention to attend so that provision for seating can be arranged.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

American Aggregates Corporation Has Growing Products Business

A Concrete Specialties Plant Also Prepared to Supply Ready-Mixed Concrete at Columbus, Ohio

EARLY in July, 1928, the Permanent Concrete Products, Inc., opened a combined concrete products and ready-mixed plant at 45 West Barthman Ave., Columbus, Ohio, this plant being one of three units owned by that company. The other plants are located at Greenville, Ohio, and Kalamazoo, Mich., with other plants to be constructed in Chicago, Ill., and Buffalo, N. Y., during 1929.

The Permanent Concrete Products, Inc., is a subsidiary of the American Aggregates Corp., with head offices at Greenville, Ohio, and this plant is an example of the trend of sand and gravel producers to take advantage of the economies their operations possess to produce cheaply high quality concrete products and ready-mixed concrete as well.

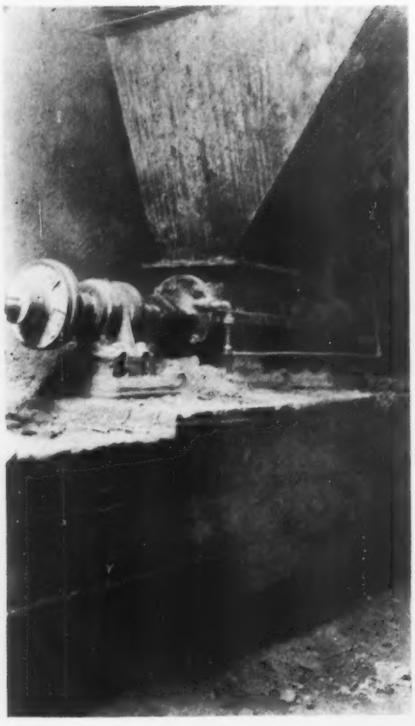
The company's output is confined principally to the production of concrete railroad crossing slabs, which are made in lengths of 6 ft. by 16¾ in. wide and either 5 or 6 in. in thickness, with a 2½-in. by ⅛-in. armour band reinforcing the outer edges. There are fourteen ¼-in. twisted steel longitudinal bars with ten ¼-in. transverse bars properly spaced as additional internal reinforcement. These slabs weigh 500 to 600 lb. each and are poured with concrete designed for 4000 lb. compressive strength at 28 days. The slabs can be supplied with or without beveled edges. In using these slabs a wood filler is supplied that acts as a flangeway.

Storage silos for aggregate and cement

In addition to railroad crossing slabs a highly diversified line of railroad sign posts, including crossing sign posts, government mail posts, elevated single and double rail rests, whistle posts, mile and highway guard posts are made at this plant. Recently an entire railroad bridge was cast in sections at the Kalamazoo plant for use in New Hampshire, and the Columbus, Ohio, plant is prepared to do this class of work also. Where the work of this kind is of large size the Permanent Concrete Products, Inc., will build a portable plant at the site where the products are to be used.

The aggregates used at the Columbus plant are secured from a belt conveyor serving the distribution yard of the American Aggregates Corp. The conveyor serving

Cement products plant of the Permanent Concrete Products Co., Columbus, Ohio—a subsidiary of the American Aggregates Corp.



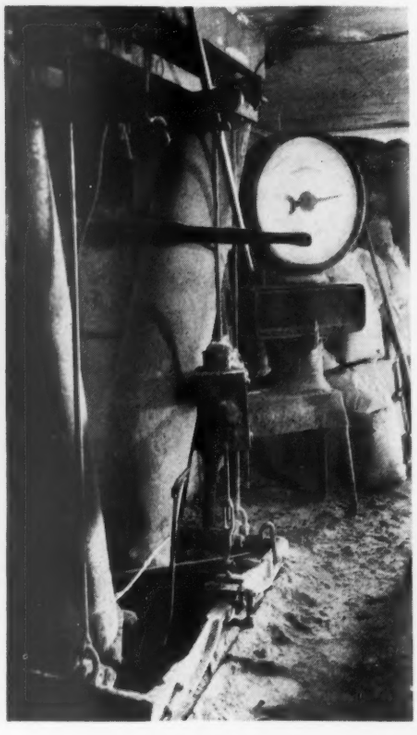
Cement in bulk is delivered to the storage silos by this pump. The use of these pumps in concrete products plants is a distinct novelty

this latter plant passes under the tracks of the T. & O. C. and Hocking Valley railroads, the gravel washing plant being on one side of the tracks and the concrete products plant on the other.

This conveyor delivers to a cross conveyor and then to the storage silos. Bulk cement is unloaded to a track hopper serving a 4-in. Fuller-Kinyon pump which delivers the cement to separate silos. The use of a Fuller-Kinyon pump is a very unusual feature for a concrete products plant and has proven to be highly successful, and has effected considerable savings as well as far greater convenience in the operation.

The plant for raw material storage has four gravel and sand silos, 12 ft. by 30 ft., built of concrete staves and having a total capacity of eight cars with two cement bins with a capacity of two cars.

The sand, gravel and cement is drawn by gravity to a Fairbanks-Morse scale hopper which discharges to a bucket elevator from which the product falls to a 2-yd. Rex concrete mixer. The mixer is so located as to discharge to skips suspended from a monorail haulage system serving the concrete products plant, or can discharge direct to transit mixing trucks. The company has three White trucks with Blaw-Knox agitator bodies. The operation of a ready-mixed concrete plant in connection with a concrete specialties plant is interesting.



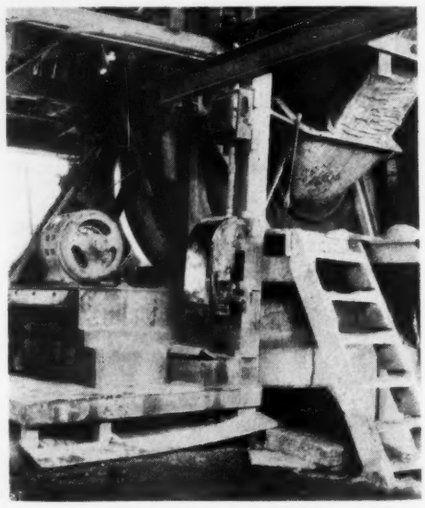
Dial scale and loading spouts

The molds after being filled and tamped are transferred to the drying room by means of Yale and Towne hoists and an overhead monorail. After the concrete has come to a final set the casts are removed to an outside storage yard for further curing.

The special shapes are all cast in steel molds and are tamped by a home-made vibrating table on which the molds rest while being filled. There are two of these vibrators and their capacities govern the output of the plant, which is rated at 100 railroad slabs, or 350 line posts per machine, and 250 yd. of ready-mixed concrete. The plant requires 9 to 15 men, depending on the number of vibrators in use. It is the intention of the company to operate the plant all the year round, and to insure favorable working conditions for the employes a four-unit Modine heating system has been installed.

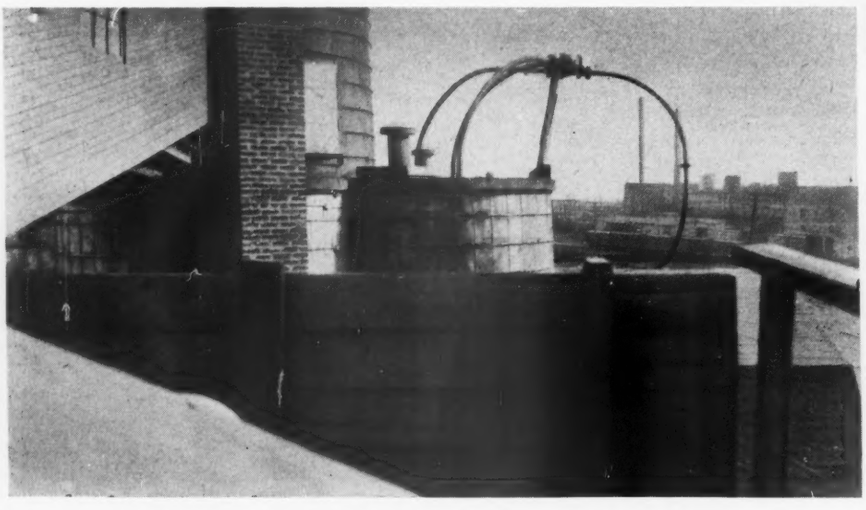
Heating Facilities Provided

In this system of heating, steam is fed to the units from a small boiler exactly the same as water is run through an automobile radiator. On the unit there is a small electric fan and as soon as the radiator is heated up and the fan turned on, a large amount of heat is thrown off which is directed downward by deflectors on the radiator.

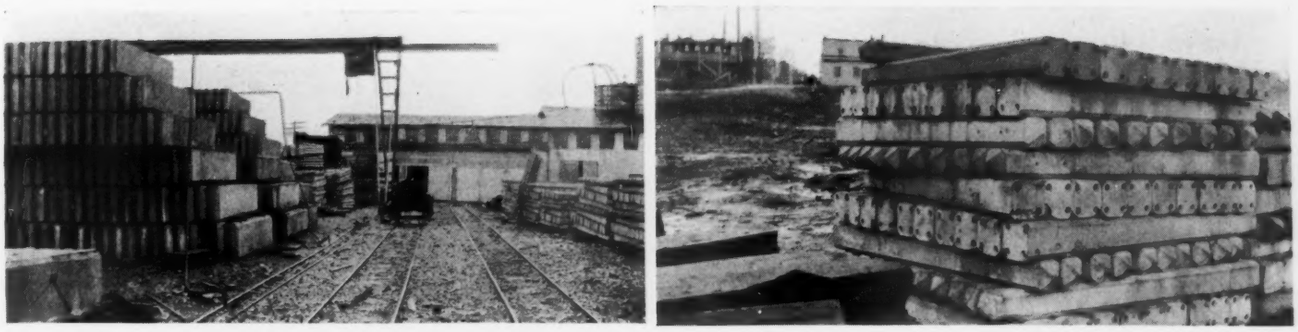


Mixer which serves both the products plant and the ready-mixed concrete plant

With one large unit the main floor of the factory, which is 40 ft. by 80 ft., can be heated, and one small unit at each kiln heats an area 12 ft. by 50 ft., with 12 ft. ceilings. The ceiling of the main floor is about 15 ft. high on the average. By placing a spray nozzle in front of the unit it is possible to keep the atmosphere moist in the



Pump lines entering the top of the cement storage silos



Storage yards showing two of the concrete specialties. At the left is a pile of crossing slabs and at the right some mail-box posts

kilns during the curing period. The system, including the heater units, was purchased from the Modine Manufacturing Co., Racine, Wis.

The plant uses a total of four motors, all of General Electric make, a 20-hp. being used on the Fuller-Kinyon pump and a 30-hp. on the mixer.

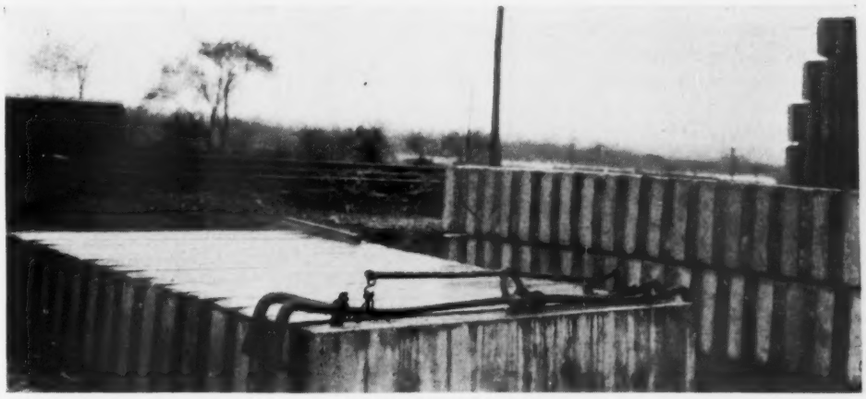
Geo. E. Nagel is manager, C. E. Haines, assistant manager, and Lawrence Winterrowd, foreman.

Three Forks Cement Plant Reported Busy

THE THREE FORKS Portland Cement Co., near Manhattan, Mont., has seldom run full capacity the year around for many years past, but this year Superintendent Leh states that he has no idea of closing down this summer, but should the plant be closed for a short spell during the summer, it would open up immediately after the necessary repair work was completed.

Thus far for 1929 the company has run without a single accident and the Three Forks plant is joining with other cement plants all over the country in an intensive campaign for the month of June to run without an accident to any of the employes.

The Three Forks plant now employs 125 men. From January 1 they have constantly employed from 121 to 150 men.—*Manhattan* (Mont.) *American.*



Reinforced railroad crossing slabs. Note the metal binder reinforcements

Ready-Mixed Concrete Plant Planned for Toledo

TOLEDO will be one of the important links in the chain of ready-mixed concrete plants being built by the Ready-Mixed Concrete Co., a new $1,000,000 syndicate, F. W. Friedman, general manager, announced recently. The first plant of the company will be opened at Milwaukee.

The syndicate will invest about $50,000 in a Toledo plant, a site for which now is being sought on Toledo's waterfront. Other plants representing similar investments will be built in Cleveland and Cincinnati and in several cities in Michigan and Wisconsin.

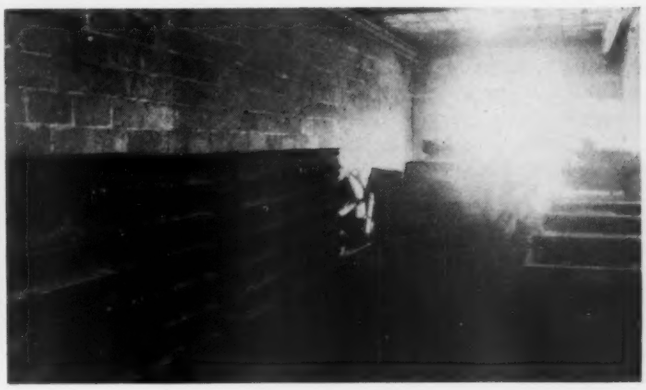
Mr. Friedman is now in Pontiac, Mich., inspecting several sites for the central plant of the syndicate. It is planned to distribute the sand and gravel to a chain of mixing plants which in turn will supply contractors with ready-mixed concrete.

The company will operate a fleet of trucks specially made to handle ready-mixed concrete in transit.—*Toledo News-Bee.*

Erratum

GORDON F. DAGGETT, whose new connection in the industry was announced in ROCK PRODUCTS, May 11, p. 95, is chief engineer of the Boehck Machinery Co., Milwaukee, Wis. The name of the company was misspelled previously.

Mono-rail system and skips transporting wet concrete mix to forms



Interior of one of the curing and drying rooms at the Permanent Concrete Products Co. plant

Kansas Cement Manufacturer Defends Proposed Tariff

THE FOLLOWING LETTER, published in the *Kansas City* (Mo.) *Star* of May 15, shows that one mid-west cement manufacturer at least believes in carrying his case to the "court of public opinion" fearlessly:

"To *The Star:* The cement industry of the middle eastern and intermountain states has become a political football in tariff jockeying at Washington. Our middle eastern cement industry comprises 80 large mills in 18 states, supporting 50,000 wage earners and having a buying power in wages and materials purchased of more than $100,000,000 a year.

"Members of the so-called agricultural bloc in Congress are making a particular attack on the cement schedule, obtensibly on the grounds that a duty on cement at seaboard will increase cement prices inland—or to the farmer. Such a claim, if made in good faith, is ill considered, and easily is refuted.

"Foreign cement never has and cannot move any considerable distance from seaboard because of high rail rates in this country. Foreign cement never has affected prices except at mills built to supply seaboard markets. A duty, of whatever amount, will have no effect on inland prices, which steadily have decreased since 1896, both in periods when cement was on the protected list and when it was not. The cement industry for the first quarter of this year operated at less than 50% of capacity, and stocks on hand in agricultural communities April 1 were 20% greater than ever before in the history of the industry.

"The duty provided for cement in the pending tariff bill is 8 cents a barrel less than the minimum cost-of-production handicap under which the most advantageously situated American seaboard mills are struggling in competition with foreign cement, according to the ways and means committee report and the United States tariff commission. The chairman of the subcommittee which wrote the cement schedule in the pending bill asserted on the floor of the house: 'The duty imposed will fall far short of affording protection to the seaboard mills, which alone must meet competition with the foreign product. The question arises: Shall we close the cement factories along the Atlantic coast?'

"Continuation of existing conditions at seaboard inevitably will result in abandonment of seaboard markets and the diversion of millions of barrels of cement annually from seaboard to inland markets. Such a movement necessarily would curtail operations in inland plants, causing further unemployment and much idle capital. Every other industry—agricultural, mining and manufacturing—which finds outlet for its products in inland territory would suffer.

"Thus, any effort to defeat this much-needed relief for seaboard cement plants must react against its authors and the constituencies they represent.

"JAMES A. LEHANEY,
"Vice-President and General Manager,
Lone Star Cement Co. (Kan.)."

Congressmen Argue for Rock Products Tariff Changes

THE MAJORITY MEMBERSHIP of the house committee on ways and means on May 18 continued to hear members of the house in connection with proposed changes in the rates provided in the tariff bill (H. R. 2667). The majority members are holding the hearings with the idea of advocating some changes as committee amendments to the bill if they deem such a course advisable.

The subjects discussed May 18 included granite, slate, gypsum and other items on which industries are seeking protection from foreign competition.

Representative Brigham (Rep.), of St. Albans, Vt., asked more protection for slate. The present law and the pending bill give slate 15% ad valorem and Mr. Brigham proposed 30%.

Representative Gibson (Rep.), of Brattleboro, Vt., asked for a rate on unfinished granite comparable with the pending rate on the finished product. He suggested this amendment to the bill:

"Paragraph 235 (a) Granite suitable for use as monumental or building or paving stone, not specially provided for, hewn, dressed, pointed, pitched, lined or polished, or otherwise manufactured, 60% ad valorem, unmanufactured, or not hewn, dressed, pointed, pitched, lined or polished, 90c. per cu. ft."

The rate in the pending bill, according to Mr. Gibson, is equivalent to leaving rough granite on the free list. He showed photographs to substantiate his argument that labor of pointing, pitching and lining already has been done on the imported granite, which comes into this country as unmanufactured. The imported products, he said, is a finished product for such purposes as rough foundations, abutments, walls and other structural use. A 25c. rate, as proposed under the bill, he said, is entirely inadequate.

Representative Sanders (Rep.), of Stafford, N. Y., asked that raw gypsum, on the free list in the pending bill, be made dutiable at $3.30 per ton. He said that the cost of gypsum rock extracted by mining in western New York approximates $1.90 per ton, while in Canada the foreign labor cost of quarrying is 61c. a ton. He said that the $3.30 rate would compensate for difference in production costs, freight rates and other factors.

Representative Wigglesworth (Rep.), of Milton, Mass., asked more protection on granite.

Signal Mountain Cement Plant Back in Production—To Have New Research Laboratory

RESUMPTION of operations at the plant of the Signal Mountain Portland Cement Co. as a result of greatly improved business conditions was announced May 10 by R. R. Caskey, secretary and resident manager.

The plant is now back in production with practically a full force, there being 150 on the payroll. Production is already up to about two-thirds capacity. The company has three kilns, two of which are now in operation.

Chattanooga will become a more important point in the cement production world, for laboratories for the testing and experimental work done by all the plants in which John L. Senior is interested are to be installed at the Signal Mountain plant.

The new laboratory will be located in what is now being used as the general office building. The general offices were moved to the Volunteer building, Chattanooga, Tenn., about May 15. Mr. Caskey explained that there will be two advantages resulting from removal of the offices into the city. In the first place the company will be in closer contact with the business interests of the city, and in the second place space for the laboratory will be provided.

Mr. Senior, who is president of the Signal Mountain company, is also interested in four other companies, two in Kansas, one in Michigan and one in Florida. Experimental work for all these will be done in Chattanooga.

The Signal Mountain plant has been practically closed down since last December. At the time of closing, however, the plant had a big stock of clinker on hand and this was made into cement during the months when the plant was not in complete operation. The quarry is also again in action, a big dynamite blast having loosened 300,000 tons of rock to be used in the production of cement during the summer.—*Chattanooga* (Tenn.) *News.*

Reduces Cement Price at Alabama Mills

THE Lone Star Cement Co. of Alabama, a subsidiary of the International Cement Corp., announced a reduction of 10 cents a barrel in the mill base price of Lone Star cement at its Birmingham and Spocari plants, effective May 3 J. W. Johnston, vice-president of the Alabama company, who made the announcement, said:

"This reduction has been made in an effort to protect the Alabama company's trade and its dealers against an unsettled condition that has been created throughout the territory served by the Birmingham and Spocari mills, partly through the introduction of foreign cement."—*Birmingham* (Ala.) *Post.*

Neville Island Cement Plant Nearly Ready to Start

OPERATION of one unit of the Davison Coke and Iron Co. cement plant on Neville Island below Pittsburgh, Penn., will be begun soon, A. P. Meyer, vice-president, announced recently. The first shipment of raw material for making cement were received early in May, he said.

The blast furnace at the head of the island will be placed in operation the week of May 27, it is expected. Formal observance of the opening of the immense new works is scheduled for September when the coke ovens will be started.—*Pittsburgh* (Penn.) *Post-Gazette.*

Canada Cement to Build Toronto Packhouse

ERECTION on the Toronto, Ont., waterfront of cement storage bins is forecast by the lease completed by the Canada Cement Co. and the Toronto harbor commission.

According to the announcement by J. G. Langton, general manager for the commission, the company will take over property west of Cherry street and north of Carton street, in the Ashbridge's bay area. The land measures 500 ft. by 304 ft.

The cement company's program will be started soon by construction of silos for storing of cement, with a capacity of 100,000 bbl. Other silos will be built from time to time as the necessity arises. The cement will be shipped to Toronto by water.

Bagging machines will be installed and the cement packed into sacks, which will be delivered to trucks or shipped by railway cars direct from the Toronto plant.

Elect Melvin H. Baker President of National Gypsum Co.

AT A SPECIAL MEETING of the board of directors, held in Buffalo, N. Y., recently, Melvin H. Baker was elected president of the National Gypsum Co. Mr. Baker, who was executive vice-president of the company, succeeds to the vacancy caused by the recent death of President J. F. Haggerty.

Mr. Baker has been closely associated with the affairs of the National Gypsum Co. since its inception, having been one of the founders of the company and directing its rapid advancement in production facilities as well as sales. In the three years that the company has been in operation, general distribution has been attained and a large dealer organization has been established throughout the United States and Canada.

The National Gypsum Co. was organized by J. F. Haggerty along the same lines that had been so successful when Mr. Haggerty was directing the destinies of the Beaver Board Companies. Mr. Baker had long been associated with Mr. Haggerty, having joined the Beaver organization as district manager in 1912 and advancing to sales manager of that company.

"The National Gypsum Co. was organized by men acquainted with the gypsum industry and consistently rapid progress has been made," stated Mr. Baker. "At a time when building activity is again increasing, the National Gypsum Co. is well organized, both financially and in plant equipment, to meet the increasing demands of its dealers and to continue its expansion program. Rapid extensions have been made in the last two years in the development of a complete line of 'Gold Bond' wall building materials and the company now operates large capacity mills at Clarence Center, N. Y., National City, Mich., and Luckey, Ohio."

Bessemer Cement to Build Packing Plant at Toledo

PLANS for building a warehousing system at Toledo, Ohio, for the use of the Bessemer Limestone and Cement Co., Youngstown, and the Peerless-Egyptian Cement Co. of Detroit, Mich., have been announced.

The Peerless and Bessemer companies are units controlled by the Bessemer Securities Co., Youngstown, Ohio.

Lockport (Ill.) Gravel Plant to Use Gulf Waterway

THE GRAVEL plant of the Material Service Corp. at Lockport, Ill., was opened recently by officials of the company. It is one of the first of the major industries to locate on the projected lakes-gulf waterway. It is planned to use the waterway to ship gravel to Chicago and to other parts of Illinois when the channel has been completed to the Mississippi river.

Operation, however, will not await the completion of the waterway, it was stated. The company has arranged with the Leathem-Smith-Putnam Navigation Co. to transport gravel from the plant to Chicago. For this purpose the navigation company has constructed a special barge which will pass beneath Chicago's drawbridges.

Gravel from a pit less than a mile from the plant will be carried there in cars, where it will be washed, crushed, screened and stocked. Reclaiming from stockpiles will be automatic loaders, loading to the specially designed barge, soon to be put in service. The boat, with a capacity of 2500 tons, is expected to carry approximately 400,000 tons a year between the plant and Chicago. Water ballast tanks run the length of the barge, and these, when filled, will lower the empty craft about 6 ft., so it will not be necessary to open bridges.—*Chicago* (Ill.) *Tribune.*

Marquette Cement to Improve Cape Girardeau Mill

ACCORDING to recent reports, the Marquette Cement Manufacturing Co. is completing plants for extensions and improvements to its Cape Girardeau, Mo., cement mill which are to cost more than $600,000. The new changes will about double the capacity of the present mill, it is said. In addition, the company is also said to be planning new storage and distributing plants at St. Louis, Mo., and Memphis, Tenn., each to cost about $75,000 with equipment.

Tripoli Crushing Plant Damaged by Fire

THE TRIPOLI crushing plant of the Independent Gravel Co., northwest of Carthage, Mo., burned with a $12,000 loss recently. The fire broke out in one of the two elevators of the structure and could not be checked with the facilities available. The loss is about half covered by insurance. The plant will be rebuilt at once and an effort made to have it in operation soon.

The plant, which has been operating night and day, was shut down just before the fire was discovered in order to make some repairs.—*Carthage* (Mo.) *Press.*

Western Pennsylvania Sand Producers Association Chartered

AN APPLICATION for a charter for the Western Pennsylvania Sand and Gravel Association was filed recently in Common Pleas Court before Judge Josiah Cohen. The organization has been formed to further the interests of the sand and gravel business in the Western Pennsylvania district.

The signers to the application for the charter were: W. A. Bliss, Beaver; Alex W. Dann, Glen Osborne; C. C. Patterson, Mt. Lebanon; Harry S. Davidson, Philander K. Rogers, H. Clay Rodgers and George Vang, all of Pittsburgh.—*Pittsburgh* (Penn.) *Press.*

New Oregon Lime Plant

A NEW LIMESTONE quarry and lime kiln will be put in operation at Ruch, near Jacksonville, Ore., according to recent announcement by J. H. Webber of Los Angeles, who heads the Standard Products, Inc., the organization building the plant. This is the first attempt to distribute limestone products from the Rogue river valley in San Francisco and Los Angeles markets.

The kiln will have a capacity of 50 bbl. of commercial lime per day. Additional units will be built for burning lime. A crusher and grinding mill are being installed to manufacture poultry grit and agricultural limestone. The output of the plant will be hauled to Medford by auto trucks.

Ohio-Pennsylvania Silica Sand Companies Merger Plans Detailed

CONFIRMATION of plans for a consolidation of 14 Ohio and Pennsylvania silica sand companies was announced May 13 by E. E. Klooz, president. The new organization has a capacity of 600,000 tons annually and supplies many middle western steel mills.

The new company will be known as the New Industrial Silica Corp. Headquarters of the $3,000,000 combine will be in Youngstown.

Companies included in the merger are Portage Silica Sand Co., Youngstown; Geauga Silica Sand Co., Cleveland; Dundee plant of the Ayres Mineral Co., Zanesville; Olive Silica Sand Co., Franklin Industrial Sand Co., Coxey Silica Sand Co., Massillon Sand and Stone Co., Corvin, Albright Sand Co., Newman Silica Sand Co., and the sand plant of the Everhard company, all of Massillon; the Beach City Silica Sand Co., Beach City; Leesburg Silica Sand Co., Leesburg, Penn., Dick Sand Co. and Venango Sand Co., Franklin, Penn.

The Portage company, which has a large plant near Phalanx on the Erie line to Cleveland, will liquidate its business, Mr. Klooz said.

The company will be capitalized for $1,500,000 in shares of 6½% preferred stock of $100 par value and 150,000 shares of common of no par value. The company will also float an issue of $1,000,00 6% 20-year first mortgage bonds.

Jacob S. Coxey, Jr., of Massillon, Ohio, is vice-president and Lee R. Farrell, Youngstown, Ohio, secretary, treasurer and general manager. On the board of directors are R. J. Raney, of Chicago, chairman; Andrew M. Scott, of Chicago, Ill., vice-chairman; Henry A. Butler and C. A. Manchester, of Youngstown; Chester Lamberton, Franklin, Penn., and E. M. Ayers, Zanesville, Ohio.

The new corporation was organized to stabilize the silica industry by reducing operating costs.—*Wall Street News* (New York City).

Additional Mica Plants Planned in the South

SEVERAL NEW plants for the production of mica in the western part of North Carolina are being considered at present, according to H. J. Bryson, state geologist, who has been spending some time in the mountainous section investigating mineral properties for the purpose of bringing the assistant of the department of conservation and development in their development.

"During the past year, five mica recovery plants and one wet grinding plant have been completed," Mr. Bryson said. "At present there are six sheet mica plants, five wet grinding plants and five recovery plants operating in the state. Construction of one wet grinding plant and one mica recovery plant are now being considered," the state geologist said.

"The Rubin Mica Co. of Sylvia has sold its holding of 2200 acres to a New York firm which plans to develop the property. Two large mica mines and one good clay deposit are now being investigated. The company has bought a site at Dillsboro and expects to build a sheet mica and a grinding plant. A clay plant on the property is the aim of the company, of which Grant Lowe of Waynesville is vice-president and general manager.

"The Consolidated Mica Co. of Spruce Pine was organized recently by W. E. Richardson of Erwin, Tenn., John V. Cox and James A. Maberry of Spruce Pine. The capital stock is $100,000.

"Several mines in Yancey, Mitchell, Haywood and Jackson counties are now being prospected to determine their value for future development," Mr. Bryson said.

A. C. O'Loughlin Joins Consumers Co.

ANDREW C. O'LOUGHLIN, president of the Central Lime and Cement Co., has been appointed general manager of the building material division of the Consumers Co.

Mr. O'Loughlin also is president of the A. C. O'Loughlin Co., producer of crushed stone, with quarries in the Chicago district. The Central Lime and Cement Co. operates several pits and maintains distributing yards throughout the Chicago area.—*Chicago* (Ill.) *Journal.*

Another Quarry Company in Gravel Business

MORE EVIDENCE of the constantly overlapping nature of the business of crushed stone and gravel producers is the announcement that the Lehigh Stone Co., Kankakee, Ill., one of the leading crushed-stone companies of the state, has leased the washed sand and gravel ballast plant of the Illinois Central railroad at Forreston, Ill.

Possession of the plant was given to take effect May 1, although the deal was completed shortly thereafter, it is understood. John Markman will be retained by the new company as manager of the plant and all men connected with the plant in past years will be retained.

It is understood locally, according to report, that the Lehigh company will purchase the plant at the end of the year's lease.

W. R. Sanborn, prominent in the National Crushed Stone Association for many years, is the active head of the Lehigh Stone Co.

North Carolina Feldspar Mills Plan Merger

A MERGER of feldspar milling companies that may include most of the plants now operating in North Carolina and involving more than $1,000,000, is reported to State Geologist H. J. Bryson as being considered.

According to the information, the plants of the North State Feldspar Co. at Micaville and that of Golding Sons at Spruce Pine, each having a daily grinding capacity of 80 tons, are already in the consolidation.

Reports from New York carry word that an agreement has been entered into for the purchase of the plant of the Tennessee Mineral Products Co., either through a merger or outright sale. The proposed sale, according to the report, involves approximately $300,000 in cash and $550,000 over a period of about four years.

"Another plan," says the report, "calling for consolidation of the Tennessee company's property with three other companies which also produce feldspar, is under consideration, the company having the privilege of taking its choice of the two proposals."

The Tennessee Mineral Products Co. has the largest producing mill now operating in the state, having a daily capacity of 150 tons of feldspar.

Consolidation of the three companies mentioned would leave only the new plant of the Feldspar Milling Co., at Bowditch, out of the merger, but it has also been reported that officials of this mill have had some negotiations with the officials of a group seeking the merger.

State Geologist Bryson has also received reports that another grinding plant is under construction at Toecane, in Mitchell county, and it is said that this plant will be the largest of any in the state. It is revealed in information received by the state geologist that the foundations for this plant have already been completed. It is reported that this mill is being built by Golding Keen, of New Hampshire, already in the merger program.—*Apex* (N. C.) *Journal.*

Columbia River Royalties

NO DEFINITE DECISION as to how royalties received from sand and gravel operators on the Columbia river shall be divided between the states of Oregon and Washington was reached at a recent conference held at Salem, Ore., attended by members of the Oregon state land board and Clark V. Savidge, commissioner of public lands for the state of Washington. The Oregon law becomes effective June 4, while the Washington law does not become effective until June 14. Another conference will be held prior to these dates.

Sand and gravel concerns operating along the Columbia river have not as yet paid their royalties on material already used but have agreed to a compromise settlement. The royalty charge is 5 cents a cubic yard.

New Machinery and Equipment

New Double-Roll Crusher for Abrasive Material

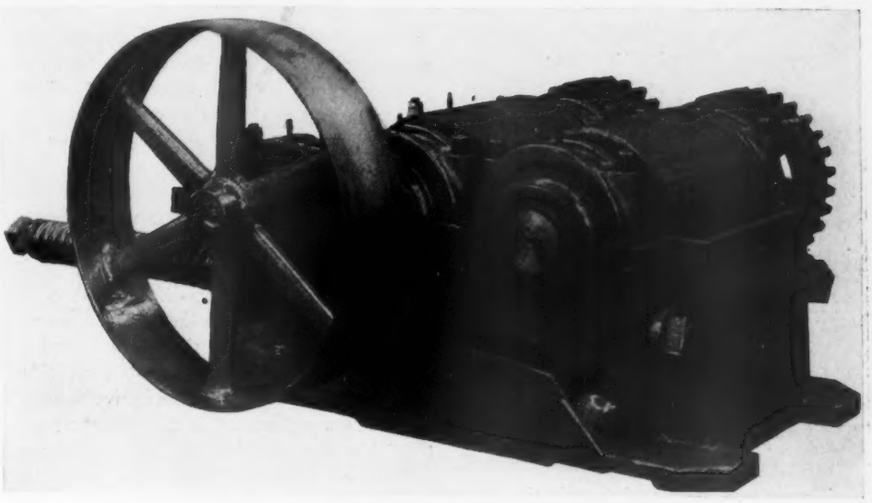
THE NEW "Oliver" two-roll crusher is especially adapted for fine reduction of slag or other abrasive rock products, according to the manufacturers. It is intended for material starting at about ½- to 1-in. size and reduces this to about ⅛-in.

The rolls are 18 in. dia. by 18 in. face, smooth-chilled or corrugated with interlocking corrugations and keyed and locked on taper shafts. The shafts are 7 in. dia. at the large end with 5½-in. journals. All boxes are of split reversible and replaceable type for both roll shafts and drive shafts. The drive gears are coarse pitch, semi-steel, driven pinion with one side shrouded.

Protective features against tramp iron have been provided and the rolls are adjustable within limits to the changing size of the material and also to compensate for wear.

The new crusher has a rated capacity at 100 r.p.m. of from 3½ to 5½ tons of limestone, crushing from ½- to 1-in. to ⅛-in. roll set openings. Alemite lubrication is used throughout. The approximate weight of the machine is about 8000 lb.

The machine illustrated herewith is with the gears uncovered to show construction and may be purchased with full gear covers. This adds another line of crushers to those heretofore built by Butterworth & Lowe, but now manufactured by the Oliver Machinery Co., Grand Rapids, Mich.



Double-roll crusher for abrasive material

Automatic Drop-Bottom Mine Cars

MINE cars with automatic drop bottoms for handling crushed rock, slag, sand and gravel, coal or other material of size small enough to pass through the bottom openings are featured by the Sanford-Day Iron Works, Knoxville, Tenn. The standardized cars are made in three lengths of sides, 8 ft., 9 ft. and 10 ft., and for four track gages, 36 in., 42 in., 44 in. and 48 in. Cars for other gages up to 56½ in. can be supplied.

Mine car with automatic drop-bottom

The automatic dumping arrangement of these cars is a distinct novelty for which is claimed simplicity and ease of operation, unfailing and foolproof, under practically all conditions of service. The accompanying cut shows one of these cars in use at the Phoenix plant of the Alpha Portland Cement Co., Birmingham, Ala. In the position illustrated, the bottom doors are in release form, the load dropping through the opening to the hopper below.

This type of car has a bottom which is comprised of three plain steel doors. The right-hand door is swung on a roller bar that passes through the car at the right-hand end, and the other two doors swing on the car axles. The left-hand door is held up by a hook which catches a wrist fastened to the left end of the left-hand door. Both of the other doors are locked by their edges resting on top of the doors next to them. In operation, the loaded car is drawn directly over the rail hopper and the latch lever at the end of the car raised by hand or by automatic tripping device. This releases the left-hand door, which swings open and, on falling through an angle of about 40 deg., releases the second door. The second door on falling releases the third door, and thus the entire load can be dumped in a fast series operation. Closing of the doors is accomplished by several different devices, all of them quite simple. Any piece of wood or rail inclined to an angle of 45 deg. and with flat top 42 in. long, which is 2⅛ in. above the rail top, will close the doors of the cars as they move along.

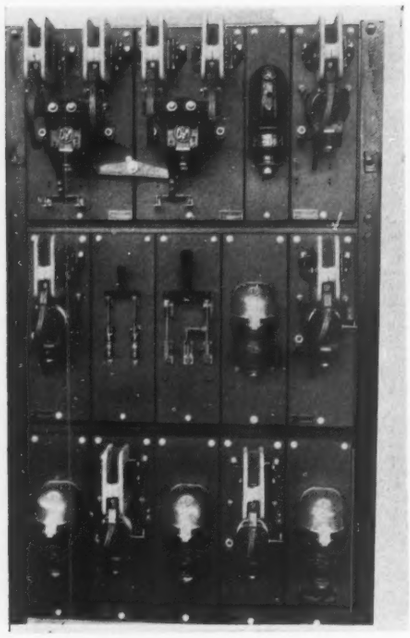
Should the latch lever be raised while the car is moving, there will be no damage or wreck, according to the makers. In explanation, the rear door can only drop until its curved surface rests on the top of the cross ties, and since the door must fall through 40 deg. to release the second door, the other doors stay closed. Very little material is lost from the car through this cause, for the opening is but a narrow slit.

Three different types of these standardized cars are made, all of which are equipped with 14-in. roller bearing wheels. These types are of all-steel construction (flare and upper work), combination steel plate and wood, and all-wood. The all-wood type can be lined with steel plate if desired.

Light-Duty Flexible Coupling

AJAX FLEXIBLE COUPLING CO., Westfield, N. Y., has recently designed a new, light-duty, inexpensive flexible coupling. This new unit is primarily intended for manufacturers of machinery who use a number of fractional or small horsepower couplings.

The Ajax Type "C" coupling is made in bores from ½ in. to 1¼ in.



Time-current control installation

New Time-Current Control

THE Electric Controller and Mfg. Co., of Cleveland, Ohio, has recently brought out a new system of electrical control designated as the "time-current control." This is claimed to be a new development using an acceleration relay operating on an entirely new principle, and is not time limit-control nor current-limit control.

The company states that the time-current acceleration relay has every advantage of the existing systems of acceleration. On light drives where fast operation means increased production, this control gives the maximum output. On heavy loads, a longer time up to two seconds per step is had automatically, and without any change in adjustment. On normal loads, forced acceleration gradually increases the torque until the motor eventually starts. The new time-current control, which embodies this new time-current acceleration relay, also uses a complete new line of shunt contactors and a new plugging relay.

A New Earth-Moving Combination

THE Miami Trailer-Scraper Co., of Troy, Ohio, has announced a new, power-operated bulldozer for attaching to the Cleveland Tractor Company's "Cletrac 30-A." This bulldozer fastens to the standard extended "Cletrac" axle, and being mounted thus, it is entirely independent of the tractor drawbar, and so does not interfere with the free use of the tractor as a pulling unit.

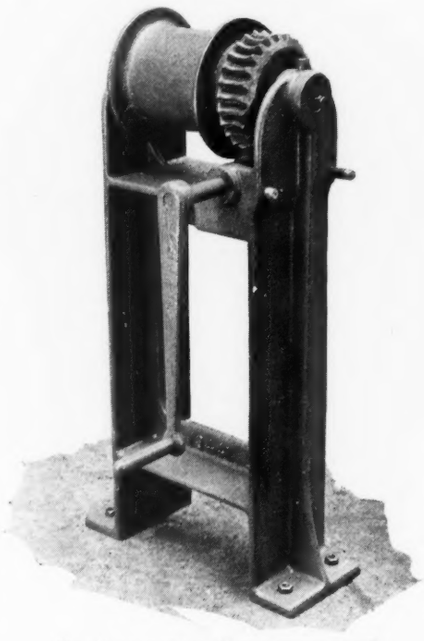
The 7-in. blade is carried on heavy "H" beams and is raised and lowered by two steel cables which are attached at the ends of the blade to insure an even lift in places where one end only of the blade is under load. Suitable rub plates eliminate all side movement, it is stated. A distinctive feature of this new equipment is the mounting of the "A"-frame (which carries the cables) directly on the track frame, thus allowing the blade to follow the contour of the ground, and minimizing any tendency of the blade to "gouge," the company states.

The power winch manufactured by the Miami company for use with the bulldozer is so designed that it is also available for power use for the Miami one-man power scraper, the Miami power dump trailer and the Miami backfiller. It can also be used for ordinary winch uses. The winch is driven from the power take-off of the tractor with a double roller chain, through a multiple disk clutch designed integrally with an over-running brake. This permits the tractor operator to control all of the movements of the load by means of only one lever, according to the announcement.

The manufacturers claim that this equipment combination provides a tool for every phase of earth moving activity. The company is now engaged in providing similar equipment for a number of other tractor makes and models.

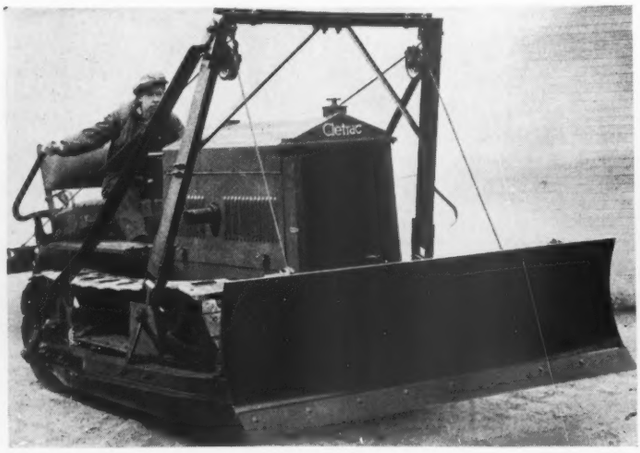
Floor Type, Hand-Operated Winch

THE Stephens-Adamson Mfg. Co. of Aurora, Ill., has announced the addition of a floor type, hand-operated winch to its line of motor and hand winches. This winch is mounted on a cast iron stand which is sturdy though light in weight. It has a cast iron worm gear which is self-locking, thus insuring the safety of the load at all times, the announcement states.

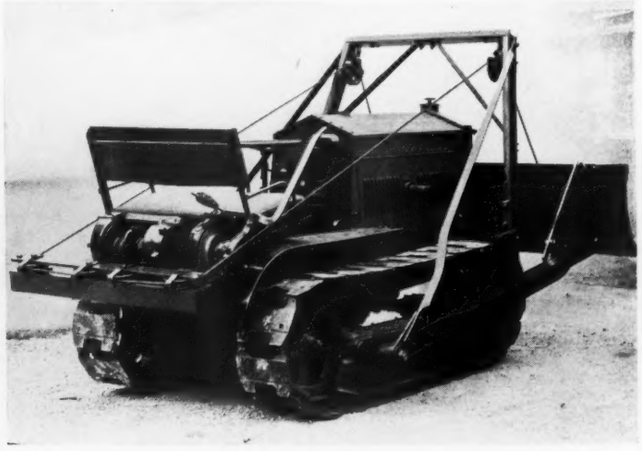


Hand-operated, floor-type winch

The winch has a rope pull of 750 lbs. at the drum. The cast iron drum, which is 6 in. in diameter, has a capacity of 100 ft. of ¼-in. cable and 60 ft. of ⅜-in. cable. From the top of the drum to the floor is 34 in., while the over-all width is 18 in. This hoist is attached to the floor by means of four bolts in the cast iron stand base. As the winch is light and portable, it can be used in any part of the plant.



New earth-moving combination showing mounting of scraper blade



Earth mover showing the winch which elevates the blade

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Mo.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.35	1.35	1.30	1.25	1.15
Munns, N. Y.	1.00	1.25	1.25	1.15	1.00	.....
Prospect, N. Y.	.80	1.15	1.15	1.15	1.15	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.25	1.05	.95	.90	1.00
Syracuse, N. Y.	.50	.....	1.00	1.00	1.00	1.00
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.....	.50	1.50
Alton, Ill.	.....	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	.90–1.15	.90–1.15	1.00–1.15	1.00–1.20	1.00–1.15	1.00
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	1.00	1.00	1.10	1.10	1.00
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05 1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.05	1.05	1.05	1.05	1.05
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.20	1.00	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.....	.90	.90	.90	.90	.....
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico, Texas	.50	.50	1.25	1.15	1.10	1.00
Cutler, Fla.	.50– .75r	.....	.....	1.75r	1.10r	.....
El Paso, Texas	.50r	1.00–1.50	1.00–1.50	1.00	1.00	.75
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.75	1.50	1.35	1.35
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35–1.40	1.40–2.10	1.60–1.90	1.40–1.50	1.40–1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	1.00

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.....	.....	1.75	1.60	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	.....	.....	2.25–2.50s	.....	.....	.....
Lithonia, Ga.—Granite	.50a	1.75b	1.60	1.35	1.25	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	.....	.....	1.50 to 1.85	.....	.....	.....
Toccoa, Ga.—Granite	.....	1.40	1.40	1.35	1.25	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) High calcite fluxing limestone, 92–98% CaCO, 1.75. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 100% thru 4 mesh 1.85

Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Blackwater, Mo.—100% thru 4 mesh 1.00

Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, 45% thru 200 mesh a5.00

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50

Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh 1.50

Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk 2.50

Cypress, Ill.—Analysis, 95% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh 1.00

Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk 3.50
Paper bags 4.75
100-lb. cloth bags 5.25
(All prices less .25 cash 15 days)

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton 6.00
90% thru 20 mesh, bulk, per ton 1.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked 5.00

Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags 3.95
Bulk 2.70

Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk 2.75

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh 3.50

Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk 2.70

Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk 1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk 2.25

Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00

Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh 4.25

Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk 1.35–1.60

Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh 1.00

Piqua, Ohio—Total neutralizing power 101.12%; 60% thru 100 mesh 2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk 3.50
100% thru 4, 30% thru 100, bulk 1.50

Rocky Point, Va.—Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk 2.00

Watertown, N. Y.—Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk 2.75

(a) Less 50c comm. per ton.

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 90% thru 10 mesh 1.50
30% thru 100 mesh 1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh 1.00–1.25

Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags 4.50

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25
90% thru 4 mesh, per ton 1.10

Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; 90% thru 50 mesh ..... .95

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 4% $MgCO_3$; 50% thru 100 mesh 1.50

Kansas City, Mo.—50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .95

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

Waukesha, Wis.—90% thru 100 mesh, 4.00–7.00; 50% thru 100 mesh 2.10

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks 6.00
Hillsville, Penn., sacks, 5.10; bulk 3.50

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio—99% thru 100 mesh, bulk, 3.50; in 80-lb. bags (f.o.b. Piqua) 5.00

Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.00

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. *1.75–2.25
Cheshire, Mass., in carload lots 5.00–7.00
Estill Springs and Sewanee, Tenn. 1.50
Franklin, Penn. 2.00
Klondike, Mo. 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .30– .35
Ohlton, Ohio 2.50
Ottawa, Ill. 1.25
Red Wing, Minn. 1.50
San Francisco, Calif. 4.00–5.00
Silica and Mendota, Va. 2.00
St. Louis, Mo. 2.00
Utica and Ottawa, Ill. 75–1.00
Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	1.00–1.25
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.25	1.25	
Attica and Franklinville, N. Y.	.65	.65	.75	.65	.65	.65
Boston, Mass.†	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.70	.90		1.30		
Leeds Junction, Me.		.50	1.75		1.25	1.00
Machias Jct., N. Y.	.75	.75	.75		.75	.75
Milton, N. H.		.50				.90
Montoursville, Penn.	1.00	.75	.80	.75	.70	.70
Northern New Jersey	.40– .50	.40– .50	1.00–1.25	1.00–1.25	1.00–1.25	
Somerset, Penn.		2.00				
South Portland, Me.		1.00	2.25			2.25
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*		.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.60	.60	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Attica, Ind.			All sizes .75–.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.		.40s	.50s	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90t
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio		.75‖	.75‖	.75‖	.75‖	
Des Moines, Iowa		.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.40	.40	.55	.85	.85	
Elkhart Lake, Wis.	.60	.30	.30	.50	.50	.50
Ferrysburg, Mich.		.50– .80	.60–1.00	.60–1.00		.50–1.25
Grand Haven, Mich.		.60		.90		.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		.85	.85		.85	
Hersey, Mich.		.50		.50	.70	.70
Humboldt, Iowa	.50	.50	1.40	1.40	1.40	1.40
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Mankato, Minn.	.55	.45	1.25	1.25	1.25h	
Mason City, Iowa		.60	.85	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.25	1.25	1.25	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.90	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.50	.50				
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.50				
Fort Worth, Texas	.75–1.00	.75–1.00	1.00–1.10	1.00–1.25	1.00–1.25	
Knoxville, Tenn.	1.00	1.00	1.50	1.20	1.20	1.20
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.30	.30	1.00	1.00	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Los Angeles, Calif.	.30	.30	.80	.80	.80	.80
Oregon City, Ore.			All grades range from 1.00 to 1.25 per cu. yd.			
Otay, Calif.		.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60		1.20		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			.40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Burnside, Conn.		.75*				
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa		.75				
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Falls, Wis.					.65	
Fort Worth, Texas						.60
Gainesville, Tex.					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					.70	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35					
Mankato, Minn.	.70					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.				.60	.60	.60
Somerset, Penn.		1.85–2.00		1.50–1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.						.60
York, Penn.	1.10	1.00				

*Cubic yd. †Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¾-in. and larger. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25			3.75	3.00
Beach City, Ohio	1.75	1.75		1.50	1.50		
Cheshire, Mass.		Sand for soap, 7.00–8.00				6.00–8.00	
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00 1.25			
Eau Claire, Wis.						3.00	
Elco and Murphysboro, Ill.		Water-floated ground silica per ton in carloads—18.00–31.00					
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.50–1.60			
New Lexington, Ohio	2.00	1.50					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25–3.25	2.25	1.25–3.25	1.25–3.25	1.25	3.50	3.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.		Potters sand, 8.00–10.00g					1.75
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅜ in. to 10 mesh, $1.25*; ¾ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[6]
CENTRAL:								
Afton, Mich.						10.00	7.50	
Carey, Ohio	11.50	7.50	7.50		8.00		7.50	1.50
Cold Springs, Ohio		7.50	7.50				8.00	
Gibsonburg, Ohio	11.50	7.50	7.50		8.00	10.00	8.00	
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[23]	1.35[16]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[16]
Scioto, Ohio	10.50	7.50	7.50	8.50	8.00	.62½	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[9]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50	8.50		7.50	1.35
Keystone, Ala.		9.00	8.00	9.00	9.00	11.00	7.50	1.35
Knoxville, Tenn.		9.00	9.00	9.00	7.50	.62½	7.50	1.35
Ocala and Kendrick, Fla.		11.00		12.00				
WESTERN:								
Kirtland, N. M.							10.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.00	17.50	13.00	17.50–19.00	14.50	.90[17]	14.50[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] To mortar plant and large industrials, 13.00. [22] To 9.00. [23] Per bbl., 2.15. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00–10.00
Ground talc (20-50 mesh), bags	7.00– 9.00
Ground talc (150-200 mesh), bags	10.00–12.00
Pencils and steel crayons, gross	1.50– 3.00
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags (bags extra)	8.00– 8.50
Same, including 50-lb. bags	9.00– 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Clifton, Va.:	
Crude talc, per ton	4.00
Ground talc (150-200 mesh), in bags	12.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
(Double air floated) including bags:	
200 mesh	13.75
325 mesh	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.00
Ground talc (150-200 mesh), bags	6.25–10.50
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Los Angeles, Calif.:	
Ground (200 mesh), in bags	14.00 25.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 68-70%	4.00– 4.50
Mt. Pleasant, Tenn.—B.P.L., 77%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00

Ground Rock (2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	3.50
B.P.L. 72%	4.50
Mt. Pleasant, Tenn.—Lime phosphate:	
B.P.L., 72.50%, 80% thru 300 mesh	11.70
B.P.L. 72%	5.50– 6.00
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66%	
B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	27.00
Mine scrap	20.00
Roofing mica	38.00
Punch mica, per lb.	.05– .12
Trimmed mica; 50% disc. from list, per ton, 20 mesh, 32.50; 40 mesh, 38.00; 60 mesh, 40.00; 100 mesh, 60.00; 200 mesh	70.00

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream, and American Botticino, coral pink, pearl blush	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica Spar		*9.00–‖12.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	12.50–14.00	12.50–14.00
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		‖9.00–¶10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50
Phillipsburg, N. J.—Royal green granite		15.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		¶8.50
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	b5.00	

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
DeKalb Jct., N. Y.—Color, white; analysis, K_2O, 2.11%; Na_2O, 6.86%; SiO_2, 74.04%; Fe_2O_3, .063%; Al_2O_3, 14.59%; pulverized, 100% thru 200 mesh, soda spar, in bags, per ton, 22.00, bulk 20.00; 100% thru 140 mesh, in bags, per ton, 20.00; bulk	18.00
Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton	9.00
Trenton, N. J.—White; analysis, K_2O, 11%-13%; Na_2O, 1.5%-2.70%; SiO_2, 63%-67.80%; Fe_2O_3, .09%; Al_2O_3, 18.25%-20%; pulverized, 99.5% thru 200 mesh	20.00
Erwin, Tenn., and Spruce Pine, N. C.	16.00
Rochester, N. Y.	22.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis. K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk, 18.00; crude, bulk (Bags 15c extra.)	10.00
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per sack	1.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, O. (b)—(Pearl Grit), fine and medium, per ton	¶8.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	7.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags. (a) F.o.b. Middlebury, Vt. (b) F.o.b. Piqua, Ohio.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	13.00–17.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) In yard, 12.50; also 12.25. (g) Delivered Milwaukee, 1300. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	.....	2.36	3.51¶
Baltimore, Md.	.....	2.25–2.65	3.55¶
Birmingham, Ala.	.....	2.00	3.44¶
Boston, Mass. (g)	.57e	2.23–2.28	3.27¶
Buffalo, N. Y.	.62½	2.10†	3.40¶
Butte, Mont.	.90¼	3.61	.....
Cedar Rapids, Iowa	.....	2.24	.....
Charleston, S. C.	.....	2.25–2.65d	3.58¶
Cheyenne, Wyo.	.64	2.56	.....
Chicago, Ill.	.....	2.05–2.45	3.35¶
Cincinnati, Ohio	.....	2.22–2.62	3.52¶
Cleveland, Ohio	.....	2.24–2.64	3.54¶
Columbus, Ohio	.....	2.22–2.62	3.52¶
Dallas, Texas	.....	1.80	3.39¶
Davenport, Iowa	.....	2.24	.....
Dayton, Ohio	.....	2.22–2.64	3.54¶
Denver, Colo.	.63¾	2.55	.....
Des Moines, Iowa	.....	2.14	.....
Detroit, Mich.	.....	1.95–2.35	3.27¶
Duluth, Minn.	.....	2.04	.....
Houston, Texas	.....	1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49	3.39¶
Jackson, Miss.	.....	2.04–2.44	3.53¶
Jacksonville, Fla.	.....	2.60b	3.79¶
Jersey City, N. J.	.....	2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.51½	2.06	.....
Louisville, Ky.	.55½	2.57	3.47¶
Memphis, Tenn.	.....	2.04–2.44	3.34¶
Milwaukee, Wis.	.....	2.20–2.60	3.50¶
Minneapolis, Minn.	.....	2.12–2.22	.....
Montreal, Que.	.....	1.60	.....
New Orleans, La.	.45½	1.82	3.77¶
New York, N. Y.	.60¾	1.93–2.43	3.37¶
Norfolk, Va.	.....	1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.	.....	2.22	.....
Pittsburgh, Penn.	.....	2.05–2.44	3.35¶
Phoenix, Ariz.	.....	3.91*	.....
Portland, Ore.‡	.....	2.40–2.90a	.....
Reno, Nev.‡	.....	2.91–3.41a	.....
Richmond, Va.	.....	2.32–2.72	3.62¶
Salt Lake City, Utah	.70¼	2.81	.....
San Francisco, Calif.‡	.....	2.21–2.71a	.....
Savannah, Ga.	.....	2.60c	3.65¶
St. Louis, Mo.	.48¾	1.95–2.35	‡3.25¶
St. Paul, Minn.	.....	2.12–2.22	.....
Seattle, Wash.	.....	†2.50–2.65j	‡3.50†
Tampa, Fla.	.....	2.40	4.08¶
Toledo, Ohio	.....	2.20–2.60	3.50¶
Topeka, Kans.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.	.....	2.12–2.52	3.42¶
Winston-Salem, N. C.	.....	2.29–2.69	3.59¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Albany, N. Y.	.43¾	1.75	.....
Bellingham, Wash.	.....	2.10	.....
Buffington, Ind.	.....	1.80	.....
Chattanooga, Tenn.	.....	2.45*	.....
Concrete, Wash.	.....	2.35	.....
Davenport, Calif.	.....	2.05	.....
Hannibal, Mo.	.....	1.90	.....
Hudson, N. Y.	.....	1.75	.....
Leeds, Ala.	.....	1.65	.....
Lime and Oswego, Ore.	.....	2.50‡	.....
Mildred, Kan.	.....	2.35	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.75	.....
Richard City, Tenn.	.....	2.05	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.80	.....

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 24c bbl. refund for paid freight bill. (c) 35c bbl. refund for paid freight bill. (d) 40c bbl. refund for paid freight bill. (e) Paid freight bill taken as part payment of invoice. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. (g) Also 2.33 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	½x32x 36". Per M Sq. Ft.	Wallboard. ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Delawanna, N. J.	.....	.....	.....	4.50–5.00	13.10–14.00	5.00	.....	7.25	.....	.....	.....	.....	25.00
East St. Louis, Ill.	Special Gypsum Products—Interior partition section, 4 in. wide, 12 in. thick and up to 10 ft. 6 in. long, per ton, 21.00; 6x6 in. and up to 10 ft. 6 in. long, per ton, 30.00; floor section, 7x16 in. and up to 13 ft. 6 in. long, per ton, 23.00.												
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	.....	15.00	20.00–25.00
Los Angeles, Calif. (f)	.....	7.50–9.50	7.50–9.50	8.50–10.00	9.00–11.00	.....	9.00–11.00	.....	29.00–34.00	.....	.....	.....	.....
Medicine Lodge, Kan.	.....	.....	.....	.....	.....	.....	.....	.....	15.00	.....	.....	.....	.....
Oakfield, N. Y.	2.50	.....	.....	5.50	6.00	6.00	.....	5.50	.....	.....	.....	15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Providence, R. I. (x)	.....	.....	.....	12.00–13.00o	.....	.....	.....	.....	.....	.....	Partition block, solid reinforced, 12x30x3", 7c per sq. ft. in truck lots		
San Francisco, Calif.	.....	.....	9.00	13.40	14.40	.....	15.40	.....	.....	.....	.....	.....	.....
Seattle, Wash.	.....	.....	10.50m	12.00m	13.00	.....	14.00	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	4.90	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00w	.....	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable. (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (f) plasterboard, 18c to 20c per yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail, 35.00; (w) 16x48; (x) 2- and 3-in. "Fabricaste" gypsum blocks, 6–7c per sq. ft.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	17.00
Cement City, Mich.	55.00¶
Chicago District‖	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	15.00c– 17.00†
Detroit, Mich. (d)	.15– .17†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.	4x8x12–5.00*
Olivia and Mankato, Minn.	9.50b
Somerset, Penn.	.18– .20
Tiskilwa, Ill.	.16– .18†
Yakima, Wash.	20.00*

*Price per 100 at plant. †Rock or panel face. ‡Delivered. ¶5x8x12, 55.00 per 1000. (a) Face. (b) Per ton. (c) Plain. (d) 8x12x16, rock or panel face, .24–.26.

Cement Building Tile

Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50-10.00; green or blue, per sq...11.50-12.00	
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	**Per sq.**
Gray	10.00
Red	11.00
Green	13.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	**Each**
5x8x12	.10

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	.....
Chicago District "Haydite"	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	.....
Ensley, Ala. ("Slagtex")	12.50	.....
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	.....
Milwaukee, Wis.	14.00	40.00
Mt. Pleasant, N. Y.	.....	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	15.50	17.50
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	26.50	45.00	53.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	.....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	.....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened 200 mesh (94-96% thru 300 mesh), $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. **Granville, N. Y.—Red, green and black, $7.50 per ton.**
Pen Argyl, Penn.—Blue-black, bulk, $6.50 per ton (10c additional per 150-lb. bag).

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. mediums	9.50–11.25	.....	.....	.....	.....	.....
No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00– 9.00	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—No. 1	8.50–11.25	(Vari-tone, 12.00–13.00)				
Medium	7.75– 9.00	.....	.....	.....	.....	.....
Hard vein	.....	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	.....	.....	.....	.....
Pen Argyl, Penn.*						
Graduated slate (blue)	.....	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	.....	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 10.50–12.50; textural, 12.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04¼; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise not

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.75	.85	.90	1.15	.....	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., 18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Tacoma, Wash.	.15	.17	.22	.30	.40	.55	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	114	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job: 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

California Lime Products Companies Merge

THE Universal Silicate Co. of Hollywood, and the Abramson-Bode Lime Products Corp. of Lindsay, have just consolidated, and a permit has been granted by the state commissioner of corporations to sell stock in the new company, which will be known as the Universal Silicate Stucco Lime Products Corp.

It is planned to make several improvements to the Lindsay plant, adding new machinery and building a narrow gauge railway connecting the quarry and plant.—*Fresno* (Calif.) *Bee.*

Standard Gravel to Build Camden, Ark., Plant

THE STANDARD Gravel Co. of Shreveport, La., one of the largest concerns of its kind in the South, has made preliminary arrangements for a plant at Camden, Ark., it is understood.

This company owns several thousand acres in Ouachita county and the tentative location of the plant is on the Hirsch property near the Ouachita river, east of the business section. It is said that Henry Hirsch, owner of this tract, has deeded the land to the company.

Gravel and sand will be taken from the Ouachita river for use in road building, railroad, construction work and other purposes. Plans call for the building of a large gravel yard in which the reclaimed gravel will be stored.

John W. Sanders of Shreveport represented his company in the negotiations. It is said many local business men are interested in the project.—*Little Rock* (Ark.) *Gazette.*

California Cement Men Not to Go to Jail

THE SUPREME COURT of California has decided that while the heads of the larger cement companies of the state might have been guilty of contempt in refusing to answer some of the questions put to them by a senate committee, the committee did not offer evidence to prove it. The indictments have been dismissed and according to California papers the investigation of the manufacturers as a "trust" which violates the state law will be dropped, at least until another session of the legislature.

At the senate committee's hearings the cement manufacturers frankly and freely every question put to them except those that demanded a showing of all their accounts, including costs and profits. They refused to disclose these and to bring their books into court on the advice of their legal counsellor, who was present at the hearings. Indictment, arrest and release on bond followed to await the decision of the supreme court.

The local newspapers say that one or two senators tried hard to have the investigation continued but the senate refused to listen to them.

Universal Gypsum and Lime Co-Receiver Named

WILLIAM J. CARTER, Sr., Fort Dodge insurance man has been named co-receiver of the Universal Gypsum and Lime Co. by Federal Judge George C. Scott, of Sioux City and will direct the operation of the corporation's local properties, it was announced. Judge Scott appointed Helsell, McCall and Dolliver, local law firm, attorneys for the co-receiver.

The Universal was placed in receivership recently by Federal Judge James H. Wilkinson at a hearing in Chicago. Eugene Holland, president of the company, was appointed receiver and the continuation of the business was authorized.

In an announcement to the stockholders, it was stated that the receivership was a move preliminary to refinancing and reorganization and would not affect the operation of the Universal properties in several states.

A group of Universal officials is expected at Fort Dodge soon to make an inspection of the local plant, located southeast of Fort Dodge.—*Fort Dodge* (Iowa) *Messinger.*

Warner Co. Moves Headquarters to Philadelphia

THE HOME OFFICE of the Warner Co., a combination of the former Charles Warner Co., Wilmington, Del., and the Van Sciver Corp., Philadelphia, Penn., has been moved from Wilmington to Philadelphia. The Philadelphia address is the same as it has been for the Warner Co.—Union Bank Bldg., 1518 Walnut St.

The Wilmington wholesale and retail offices will remain in Wilmington at the foot of Market street.

H. Glenn Ireland

H. GLENN IRELAND, of Birmingham, Ala., president of the Birmingham Slag Co., died May 19, at the Harbor Hospital, New York City, where he underwent an operation Wednesday. He was forty-four years old.

Mr. Ireland was a prominent sportsman and was widely known as the owner of Ireland's Grey Mist, a bird dog that has won many field trial prizes.

He was born at Middle Point, Ohio. His wife, Mrs. Pauline Ireland; a daughter, Colleen; a son, Charles; two brothers, C. Eugene and C. Byron, all of Birmingham, and his father, C. L. Ireland, of Van Wert, Ohio, survive.

Low Prices for Gravel in Oregon

TWO contracts for gravel, each for 6000 cu. yd. delivered in bunkers, were awarded by the Marion county court, Oregon to Saxon and Looney, the low bidders. The price basis was 62½c per cu. yd. for gravel delivered at East Independence bunkers and 65c. per cu. yd. for the gravel delivered at the Whitman bar. Two other companies submitted bids—the Oregon City Sand and Gravel Co. offering to deliver the gravel in bunkers at 89c. per cu. yd. and the Independence Sand and Gravel Co. bidding 65c. per cu. yd. for delivery to East Independence bunkers.—*Salem* (Ore.) *Journal.*

Montreal Splits Cement Contracts

THE city council of Montreal recommended splitting the $300,000 contract for the supply of cement which the city requires for its public works this season. The city administrators in their communication to the aldermen declared they had taken into consideration a report, they attached, from the director of public works, on the tenders received for the supply of about 130,000 bbl. of cement, and that in compliance with that report they recommended the contract be granted to the Canada Cement Co. for 70% of the total quantity required; and to the National Cement Co. for 30% at the price of $2.34 a bbl., less 10 cents a barrel on payment in 20 days after delivery and before the 10th of the month following delivery.

Fred T. Evans Appointed P. C. A. Engineer

FRED T. EVANS has been appointed engineer with the Portland Cement Association, succeeding F. R. Zaugg, who recently resigned to enter the building products field in Tacoma.

Mr. Evans is a native of Seattle, and attended the University of Washington. For many years he was superintendent and manager of the Uplands properties at Victoria, B. C. For three years he was salesman with the Peerless Concrete Products Co. of Seattle. His training and experience adapt him to the new work he will follow in the concrete products line in this territory.—*Seattle* (Wash.) *Journal of Commerce.*

Tariff Reports on Cost of Chalk and Whiting Are Completed

THE United States Tariff Commission has approved and directed to be sent to President Hoover two reports covering the costs of producing whiting and precipitated chalk. In view of the fact that these reports are of a confidential nature, the commission stated that they would not be public until such action was directed by the President.

Every manufacturing executive will do well to become familiar with TEXROPE *Drive and its remarkable advantages.*

In *almost* every industry

these short-center, endless belts are giving continuous operation!

THE TEXROPE DRIVE as manufactured by Allis-Chalmers offers continuous, low cost operation in a measure never before provided by any method of power transmission.

TEXROPE is 98.9% efficient. It is positive, slipless and vibrationless. Its flexibility permits its use where the shafts are short distances apart, thus effecting considerable savings in space. TEXROPE is silent in operation even after years of service.

The uses for TEXROPE Drive are endless. In almost every industry these drives are cutting costs and eliminating shutdowns formerly caused by less perfect methods of transmission.

TEXROPE requires no lubrication or maintenance. There is practically no wear on the belts. Continuous operation is assured. Should an accident put one or two belts out of commission, the others will keep up operation until it is convenient to make the replacement.

TEXROPE is positive, slipless and trouble-proof. It requires no lubricant. Moisture, dust and dirt do not affect it. Vibrationless — smooth in starting and running. It is shock-absorbing, simple and safe.

In addition to TEXROPE *Allis-Chalmers manufactures Crushing, Mining and Metallurgical Machinery, Air Brakes, Air Compressors, Cement Machinery, Condensers, Electrical Apparatus, Diesel and Corliss Engines, Plate Work, Forgings, Flour Mill Machinery, Hoisting Equipment, Hydraulic Machinery, Power Transmission Systems, Pumps, Saw Mill Equipment, Power Shovels, Timber Preserving Machinery, Tractors, Steam and Water Turbines.*

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News of All the Industry

Incorporations

Keystone Sand Co., dissolved.

The Silica Sand Co., Knoxville, Tenn., $75,000.

West Side Sand and Gravel Co., Battle Creek, Mich., $10,000.

Carolina Marble Quarries Corp., Andrews, N. C., $450,000. C. C. Martin and J. C. Christie.

John R. Hackman, quarry operator at Liberty, Penn., filed a voluntary petition in bankruptcy.

Silica Sand Co., Knoxville, Tenn., $75,000. H. A. Johnson, W. C. Anderson and C. A. Scheibel.

Dickason Sand and Gravel Co., Cayuga, Ind., $5000. B. D. O'Connor, Indian agent, Cayuga.

Nardone Ciferri, Millbrook, N. Y., $25,000. Russell, Jacobs and Brevoort, Poughkeepsie, attorneys.

Diamond Mortar Co., Inc., San Antonio, Texas, $10,000. K. L. Zinch, W. H. Raschke and H. Dickson.

Lime Products Co., Fordyce, Ark., has decreased its capital stock from $400,000 to $300,000. A. B. Banks is president.

Standard Sand and Gravel Corp., $20,000. Brower, Brower and Brower, 26 Court St., New York City, attorneys.

Center Sand and Gravel Co., Omaha, Neb., $10,000. A. E. Roberts, E. H. Tiffany, H. J. Laudeman and C. E. Moffitt.

Tuckaseegee Mineral Development Co., Asheville, N. C. J. A. Matlin and J. C. Cheeseborough, Jackson Bldg., Asheville, N. C.

South Carolina Gravel Co., Columbia, S. C., 2500 sh. preferred, no par value and 20,000 sh. of common, no par value. B. F. Johnson, C. H. Gerald.

Grove Block and Supply Co., Cedar Grove, Wis.; 250 shares at $100 each. To deal in cement blocks, etc. B. Voskuil, H. Voskuil and Henry Voskuil.

Wisconsin Shale Products Co., Fond du Lac, Wis.; 250 shares at $100 each. To deal in tile, brick and crushed stone. W. Gregg, E. Gregg and R. Tyrrell.

City Iron Ledge Co., Bridgeport, Conn., $50,000. 2000 sh. of $25 par value each. B. Boardman and M. H. Hall, both of Bridgeport and Jonathan Grout of Fairfield, Conn.

Dundee Limestone Co., Wilmington, Del., $200,000. Deal in limestone and limestone products. M. Lucey, R. E. Thompson and H. B. Money. (Colonial Charter Co., Wilmington.)

Cudahy Cement Block Co., Cudahy, Wis.; 250 shares common stock, par value $100. To deal in cement blocks of all kinds, etc. A. Anania, G. Karros and G. Kamakian.

Calumet Hardstone Brick Co., Chicago, Ill.; $200,000. To manufacture and sell hardstone brick, sand, gravel, stone, etc. Robert A. Swe, G. A. Dahlberg and Frank Novotny, 139 N. Clark St., Chicago.

American Concrete Marbelite Co., Chicago, Ill.; $25,000. To manufacture and sell concrete products, etc. P. C. West, D. B. Hanna, J. R. Winterbotham. Correspondent: Gallagher, Kohlsatt, Rinoker and Wilkinson, 231 S. La Salle St., Chicago.

Quarries

Kentucky State Quarry at Tateville is being opened with 50 convicts on hand for labor.

Decorah Stone Products Co., Decorah, Iowa, has leased its quarry to M. O. Weaver, local road contractor for three years.

Rockwood-Alabama Stone Co., Rockwood, Ala., has let the contract to Ingalls Iron Works Co., Birmingham, for 150 tons of steel to be used in a crane runway.

Suburban Land and Stone Co., Saugus, Mass., it is reported in the Boston *Transcript*, has been petitioned into involuntary bankruptcy on the action of three creditors whose claims total $13,708.

American Black Granite Co., Mellen, Wis., has completed a temporary spur railroad line directly into its quarry. The new 110-ton locomotive crane is now in daily use. Other activities of the company include the dismantling of all the electrical machinery at the old Berkshire mine which has been purchased by the granite company for removal to the Mellen quarry. Contract has also been let for the laying of the water main from the quarry to the lake, which must be completed before the large air compressor can be put in capacity operation.

A. K. Haines Chemical Co., Versailles, Ohio, has started work at its Fort Recovery Stone Quarry Co. quarry, an operation to be worked as a subsidiary concern. Fertilizer, soil neutralizers and mineral hog feed will be produced at the plant.

Inland Lime and Steel Co., Manistique, Mich., has awarded contract for the harbor developments at that place to Merritt, Chapman and Scott Co. This contract, in connection with the Inland company's $3,000,000 building program, calls for construction of dock facilities and a large breakwater.

Oliver Buland is planning the development of limestone lands near Pontiac, Mich. He is reported to have purchased modern rock-crushing equipment, screens, etc., which will be installed on the property. Operation of the deposit will be under a royalty agreement with May Babcock, the owner.

National Lime, Cement and By-Products Co., Tuscumbia, Ala., is reported to be purchasing equipment for a new plant to be built near Tuscumbia. The initial unit will cost about $300,000. Quarry equipment is expected to be in place about June 1. F. L. Hoff is president and Charles Sumner, Sheffield, agent.

Marsh Construction Co. has contracted to take out the rock from the quarry at Falls City, owned by the Oregon Lime Products Co. of which Dr. W. L. Pemberton and A. A. Muck of Dallas, Ore., are the principal stockholders. An output of from 300 to 400 tons per day is anticipated for the first year of operation. The use of agricultural lime has been increased in the district, and a large market is expected for it in the Williamette Valley, Ore.

Sand and Gravel

Enos Sand and Gravel Co., Brookshire, Texas, has recently expended over $75,000 in modernizing its equipment.

Northeast Missouri Gravel Co.'s plant, located near New London, Mo., is being rapidly put into shape for operation.

Decatur Hydraulic Sand and Gravel Co., Decatur, Ill., is stripping new area preparatory to excavation for sand and gravel.

American Aggregates Corp. has installed a battery of storage silos for various sizes of sand and gravel at its Kalamazoo, Mich., plant.

Independent Gravel Co., Carthage, Mo., has been awarded contract for 35,000 tons of crushed limestone to be used in concrete work on state highways 38 and 71.

Ohio Sand and Gravel Co., Columbus, Ohio, has been granted permission to make use of the city's railroad spur track. The ordinance provides for a 25-year lease at $60 per year rental plus $3 for every company car passing over the spur.

Pioneer Sand and Gravel Co., Seattle, Wash., is reported to be planning expansive improvements to its plant. The extensions will include increased storage and distributing facilities, conveying and handling equipment, mechanical loaders and other machinery. Total cost of the changes is estimated at about $300,000.

Wisconsin Wilcox Gravel Co., operator of a large plant six miles northeast of Clinton and another plant in Janesville, Wis., has announced it will not operate the Clinton plant this year. The Clinton plant has employed from 16 to 18 men the past three years and had a production of between 45 and 60 carloads of gravel daily.

Cement

Lehigh Portland Cement Co., New Castle, Penn., is reported in operation after a shutdown of several months.

Cowell Portland Cement Co., Cowell, Calif., is installing "Norblo" dust-collecting equipment in its pack-house.

Atlas Portland Cement Co. has appropriated a fair sum of money to be expended in the beautification of the premises about its new plant being built near Waco, Tex.

Petoskey Portland Cement Co., Petoskey, Mich., is installing "Norblo" dust-collecting equipment in its new pack-houses at Detroit and Milwaukee.

Marquette Cement Manufacturing Co. is soon to award contracts for storage and unloading plants at St. Louis, Mo., and Memphis, Tenn., to link up with its manufacturing plant at Cape Girardeau, Mo.

Miscellaneous Rock Products

American Cyanamid Co. is planning the expenditure of $300,000 in the development of a pebble phosphate deposit at Sydney, Fla.

C. L. Graber, Cleveland, Ohio, is reported to be negotiating for extensive deposits of crystal quartz within the boundaries of the Ouachita National Forest.

J. M. Zeesman, Chicago, has purchased equipment for operating mica mines near Lineville, N. C., and in Randolph county, and plans the establishment of a plant for manufacturing mica products.

Banner Rock Division of Johns-Manville Corp., Alexandria, Ind., manufacturer of insulation products, is said to have plans for two additions, one and three stories, 120x160 ft. and 50x190 ft., to cost more than $100,000 with equipment.

Marble Mountain Co., Los Angeles, Calif., is erecting equipment to develop recently leased deposits on Marble Mountain near Alpine, Tex. The leasehold covers about 480 acres and contains marble in all colors, according to report.

Pink Granite Co., Burnet, Tex., is said to be planning the installation of a marble polishing plant to cost about $30,000. The entire plant will be electrically operated and about 150 ft. of finished marble produced daily. Thomas Darragh is president.

Cement Products

Lakeside Cement Products Co., Duluth, Minn., has installed new handling equipment and automatic stripping, increasing its output to 1000 blocks per day.

T. C. Loomis and **L. P. Boatwright** have acquired a plant at Aiken, S. C., and ordered equipment for production of cement block and other products.

American Duntile-Duntex Co., Jacksonville, Fla., is reported to have purchased the entire capital stock, plant and equipment of the Duntile Co., Inc., of Atlanta, Ga. F. Clawson is president.

Commercial Concrete and Material Co., St. Louis, Mo., is erecting a ready-mixed concrete plant of 500 to 1500 cu. yd. daily capacity. The estimated cost of plant and equipment is about $150,000. Joseph Kesl, Jr., is president.

Pioneer Sand and Gravel Co., Seattle, Wash., has installed the "mix-meter" and other measuring devices manufactured by Chain Belt Co. of Milwaukee, throughout all its Seattle plants. These measuring devices are said to be the first of their kind to be used anywhere.

Alabama Concrete Pipe Co., Birmingham, Ala., is reported to have secured the contract for concrete sewer pipe for three projects in Birmingham. The requirements are for about 30,000 ft. of pipe. This company is making shipments for a sewer project at Knoxville, Tenn., requiring over 130 carloads of pipe and for Tennessee highway work which will also take about 130 carloads.

Personals

L. T. Tandberg has been appointed branch manager of the Los Angeles, Calif., office of the Wagner Electric Corp., St. Louis.

Millard Bryan has been named manager of the Joplin Marble Corp., succeeding Leo McNerney. Mr. Bryan was formerly a quarry operator at Carthage, Mo., and following disposal of his property at that city joined the Joplin company.

Charles Boettcher, president of the Ideal Cement Co., Denver, Colo., and a member of the New York Stock Exchange firm of Boettcher, Newton & Co., has been elected a director of Alexander Industries, Inc.

M. R. Carrier has resigned as president and director of the Leonard Gravel Co., Lansing, Mich. **Homer Luce** was elected president of the company following Mr. Carrier's resignation and Ernest Heller named a director.

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Ben E. Teschner, for the past eight years manager of A. McMillan Co., building materials, has been named district representative in the Pacific Northwest for the Monolith Portland Cement Co., covering Oregon, Washington and Idaho. He succeeds Sam D. Clinton, who has been transferred to the company's Denver office.

Bert Koenig, of the Koch Sand and Gravel Co., Evansville, Ind., is interested in a move to establish a zoological garden in one of the city parks at Evansville. Already an elephant, an elk and a zebra have been secured, and other animals will be bought from time to time. Mr. Koenig is an officer in the recently organized zoological society formed at Evansville.

Nelson S. Greensfelder, advertising manager, Hercules Powder Co., was one of the principal speakers at the conference on advertising and selling, held in Washington recently under the auspices of the National Industrial Advertisers Association, of which Mr. Greenfelder is president; the Industrial Committee of the Association of National Advertisers, Inc., and the Associated Business Papers, in conjunction with the United States Department of Commerce.

James E. Dunn has been appointed district engineer of the Portland Cement Association at Nashville, Tenn., for the territory comprising the state of Tennessee. Mr. Dunn studied electrical engineering at Purdue University and graduated in civil engineering at Vanderbilt University in 1923. He has done work with the Kentucky Department of State Roads and Highways and the Tennessee Department of Highways and Public Works. Since 1925 he has been employed in the Nashville district for the Portland Cement Association as field engineer, and more recently as acting district engineer at this office.

Obituaries

Joseph Preston Wilburn, 50 years old, of Louisville, Ky., watchman on the E. T. Slider Sand and Gravel Co. dredge anchored at the Ohio river front near Tell City, Ind., was drowned when he made a misstep while walking along the side of the boat and was carried beneath the water by the gravel conveyor.

Manufacturers

The Allen Cone Co., New York City, has moved its offices from 90 West St. to 30 Church St., New York City.

The Dorr Co., New York City, announces that its Chicago office, formerly at 310 South Michigan Ave., is now located at 333 North Michigan Ave.

The Mine and Smelter Supply Co., Denver, Colo., announce that their New York office is now located in the Transportation Bldg., 225 Broadway.

Philadelphia Gear Works, Philadelphia, Penn., to better serve its customers in the Pittsburgh district, has opened a branch sales and engineering office in the Farmers Bank building, Pittsburgh, Penn.

Pennsylvania Pump and Compressor Co., Easton, Penn., announce the appointment of Carpenter and Byrne, 4 Smithfield St., Pittsburgh, Penn., as their sales representatives in the Pittsburgh district.

Bucyrus-Erie Co., South Milwaukee, Wis., has moved its Chicago district office to 105 W. Adams St., 1312 Bankers Building. The company's complete line will be handled by A. R. Hance and by W. K. Fawcett from this office.

Wagner Electric Corp., St. Louis, Mo., advise that K. G. Baker has been added to their Cincinnati sales force. Mr. Baker is a graduate of Purdue University, and has previously been connected with Century Electric Co. and Fulton Iron Works, both of St. Louis.

Merco Nordstrom Valve Co., San Francisco, Cal., has opened two new offices, a Pittsburgh office in the Clark Bldg. of that city and a Detroit office at 2842 W. Grand Boulevard. The company has also removed its Los Angeles offices from the Union Bank Bldg. to 556 S. San Pedro St., where they will have greater facilities.

Lincoln Electric Co., Cleveland, Ohio, has appointed C. M. Taylor as sales manager. Mr. Taylor graduated from Western Reserve University in 1916, and immediately entered the employ of the Lincoln Electric Co. With the exception of two years spent in the United States Army Air Corp., during the war, as an aviator, he has been with the company continuously since then in various executive capacities.

Chain Belt Co., Milwaukee, Wis., announces that W. H. Brand, vice-president of the First Wisconsin Co., has been elected a director of the Interstate Drop Forge Co., which company is affiliated with the Chain Belt Co., at the annual meeting of the directors. Edgar L. Wood, W. C. Frye, C. R. Messinger, W. J. Nugent, Clifford F. Messinger, L. S. Peregoy and C. E. Stone are the directors re-elected.

Link-Belt Co., Chicago, Ill., announce that James S. Watson has been elected vice-president, with headquarters at the company's Dodge Works in Indianapolis, Ind. Mr. Watson has been with the company continuously for 34 years, for the past nine years as general manager of the Dodge Works, in charge of the production of silent and roller chain drives, and from which point he also continues to be responsible for the selling of these drives.

Cutler-Hammer, Inc., Milwaukee, Wis., to provide facilities to better service its trade in the East Cntral states, has established a warehouse at Cleveland, Ohio. The company has leased 1600 sq. ft. of floor space for the storage of stock for quick deliveries, and the territory to be served from this source consists of the states of Ohio and West Virginia, the province of Ontario, western New York, Pennsylvania and sections of Maryland, Indiana, Tennessee and Kentucky.

Brown Instrument Co., Philadelphia, Penn., is expanding its plant by the following additions, to be erected at a cost of approximately $200,000, and which will increase the floor space of the plant about 50%. A new two-story and basement building to be erected on the site of an existing one-story wing, which is to be demolished; a new central wing of two stories and basement. The project outlined is the fourth addition the company has made to its plant in eight years.

Alexander Milburn Co., Baltimore, Md., at its annual stockholders meeting recently elected E. P. Boyer vice-president. Mr. Boyer became associated with the company in 1919 as its Philadelphia district manager. In 1926 he established the Milburn Sales Corp., handling the Philadelphia territory and later the New York and Chicago sales. Later he was elected vice-president of the Milburn Sales Corp. and the Milburn Paint Spray Corp., which are the distributors for all the products of the Alexander Milburn Co.

General Electric Co., Schnectady, N. Y., at the last meeting of its board of directors elected two commercial vice-presidents. Wm. J. Hanley, manager of the East Central district with headquarters in Cleveland, and Chas. K. West, manager of the Atlantic district with headquarters in Philadelphia, have been elected vice-presidents in charge of the commercial activities of the company in their respective districts. Both men are veteran commercial men of the company, Mr. Hanley's period of service dating clear back to the old Thomson-Houston Electric Co., one of the predecessors of General Electric, and Mr. West having been with the company since 1899.

Marion Steam Shovel Co., Marion, Ohio, in connection with their exhibit at the recent convention of the National Crushed Stone Association, staged a contest to show the merits of "Kinerium" a steel intended primarily for the tipping of dipper tooth points. Prizes valued at about $250 were offered by the Marion Co., and were won by the following: J. W. Ireland, Lambertville Trap Rock Co.; C. A. Munson, New Haven Trap Rock Co.; John A. Murphy, Albany Crushed Stone Corp.; Geo. J. Fredericks, Consolidated Stone & Sand Co.; Claude L. Clark, Ohio Crushed Stone Assn.; A. G. Seitz, Rock Cut Stone Co.; Wm. Mohr, John T. Dyer Quarry Co., and Harold E. Shelatree, Union Limestone Co.

M. T. Lothrop

Timken Roller Bearing Co., Canton, Ohio, at a meeting of its board of directors on May 7 elected Marcus T. Lothrop president of the company, succeeding H. H. Timken, who becomes chairman of the board. Mr. Lothrop started with the company in 1911 as metallurgist, and since then has been intimately connected with its affairs, being closely associated with H. H. Timken. For the past few years he was vice-president and general manager of all operating and sales. Other officers elected were W. R. Timken, J. G. Obermier, J. W. Spray, T. V. Buckwalter and H. J. Porter, vice-presidents, and J. F. Strough, secretary-treasurer. Another of the company's old-timers who has been advanced is Judd W. Spray, vice-president and general sales manager, who was made one of the directors at the recent annual stockholders' meeting. A. C. Ernst of Cleveland, Ohio, is another newly elected director. All of the previous members of the board of directors were re-elected.

E. I. du Pont de Nemours & Co., Wilmington, Del., held its 12th annual convention of the technical section of the Explosives Department at Wilmington, Del., recently. Arthur LaMotte, manager of the technical section, presided over the meeting which was attended by nearly 100 representatives. The activities of the year formed the keynote on which numerous papers were based, and J. Thompson Brown, general manager of the Explosives Department, outlined the work of last year, and described the inter-relationships of the various departments of the company and its subsidiary concerns. Safety in the underground handling of explosives was given lengthy consideration, and practically every phase of the uses of explosives for industrial purposes was covered in the discussions.

Foote Bros. Gear and Machine Co., Chicago, Ill., on June 1 will move its general offices from 215 N. Curtis St. to more modern and commodious quarters at 111 N. Canal St. The factory organization will remain at 215 N. Curtis St. and will be operated from the general offices as one of the five manufacturing units of the company. The early part of the year the company acquired the following three companies engaged in the manufacture of tractors and graders: Northwestern Steel and Iron Co., Minneapolis, Minn.; Bates Manufacturing Co. of Joliet, Ill., and the Stockland Road Machinery Co. of Minneapolis, Minn. These companies have been organized into a new division known as the Road Machinery Division.

Trade Literature

***NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention* ROCK PRODUCTS.**

Small Vertical Motors. Illustrated bulletin No. 158 on small vertical motors, covering all types, in ratings of ⅛ to 1½ hp. WAGNER ELECTRIC CORP., St. Louis, Mo.

Portable Compressors. Bulletin No. 797, fourth edition, on portable compressors, gasoline engine driven, in five sizes, viz.: 100, 160, 220, 265 and 310 cu. ft. free air per minute. CHICAGO PNEUMATIC TOOL CO., New York.

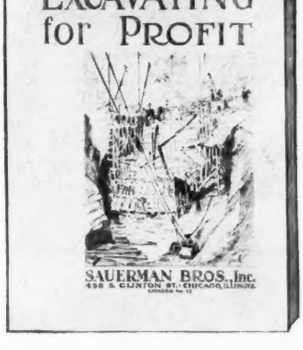
Cone Crushers. New 26-page catalog describing the Symons cone crushers, now being manufactured and sold by the Nordberg Mfg. Co. Includes illustration and data for all sizes. NORDBERG MFG. CO., Milwaukee, Wis.

Recording Instruments. Interesting broadside, entitled "Metering Hot Charging Oil at 800 Pound Pressure," dealing with flow meters for measuring steam, water, oil, glass, air, gasoline, etc. THE BROWN INSTRUMENT CO., Philadelphia, Penn.

Explosives. "Brands of du Pont Explosives and Uses to Which They Are Adapted," is the title of a most interesting bulletin designed for the purpose of aiding users of explosives to avoid the purchase of unsuitable explosives, and to select those which will give the best results in proportion to cost. E. I. DU PONT DE NEMOURS & CO., INC., Wilmington, Del.

Excavating for Profit. Sand and gravel plant operators will find much information of definite interest to them in the 56-page booklet, entitled "Excavating for Profit," just published by Sauerman Bros., Inc., 430 S. Clinton St., Chicago. This booklet treats of the design, construction, principles of operation, and the varied uses of the Sauerman slackline cableway excavator in excavating and rehandling earth materials.

A variety of sand and gravel installations are illustrated, showing machines with capacities ranging from 10 to 200 cu. yd. per hour, digging in rivers, under-water pits, and deep, dry deposits.



Details in the design and construction of the component parts of the equipment are covered very thoroughly with large scale illustrations of the many new, improved features of equipment such as excavator bucket suited to all kinds of digging, roller-bearing sheave blocks, steel masts, 2- and 3-speed power units, etc.